



## DOCTOR OF BUSINESS (DBA)

### **An Investigation into Learning Organisation Maturity & The Integration of ICT into Teaching, Learning & Assessing In The Institute of Technology Sector In The Republic of Ireland**

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**An Investigation into Learning Organisation  
Maturity & The Integration of ICT into  
Teaching, Learning & Assessing  
In The Institute of Technology Sector  
In The Republic of Ireland**

Volume 1 of 1

Pearse Murphy

A thesis submitted for the degree of

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in Higher Education Management

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## Abstract

This study is set in an era of changing management styles, shifts in the role of the educator, increasing competition, evolving student cohorts and rapidly changing modes of delivery, in the presence of change drivers such as the ubiquity of computing systems, in higher education in the Institute of Technology (IOT) sector in Ireland. The study may be described as deductive (Bryman & Bell 2007) in its approach to the examination of the alignment of practice in integrating information and communications technology (ICT) into teaching learning and assessing (TL&A), against a strategic framework based on the idea of a measure of learning organization maturity in the IOT sector in Ireland. The literature review found that throughout the evolution of strategic thinking, higher education institutes (HEIs) have endeavoured to adopt many of the strategic models, associated with the wider business community, which have emerged over the latter half of the 20th century. However differences in governance, organizational structure, decision making mechanisms and expectation have led to resistance to and rejection of many of these strategic approaches. As part of this study, strategic initiatives supporting ICT integration are examined from different stakeholder perspectives such as those of management and academic staff. The study then moves on to exploration of the idea of learning organization maturity to ascertain its suitability as a strategic framework for the purposes of this study. The study poses the research question:

*Is it possible to correlate, the identification of learning organization maturity, with the level of integration of ICT into TL&A in the IOT sector in Ireland?*

To seek answers to this question and derivative questions the management (both academic and non-academic) and the academic staff cohorts within the subject institutes were surveyed online using a learning organization profile (LOP) tool, adapted from the work of Marquardt (2002), and a new ICT integration level investigative tool developed by the writer. Findings were statistically analysed to establish whether differences exist in learning organizational profiles (LOP) for different cohorts and category variables. Where practicable comparative analyses with similar studies unearthed in the literature review were undertaken. Next correlation between learning organization maturity and ICT integration levels is examined. Finally conclusions are drawn where they emerged and recommendations for possible follow up studies are outlined.

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## List of Abbreviations

AIT	-	Athlone Institute of Technology
BECTA-		British Educational and Computer Technology Agency
CHEPS-		Centre for Higher Education Policy Studies (in Netherlands)
CIO	-	Chief Information Officer
CMC	-	Computer-Mediated Communications
CRM	-	Customer Relationship Management
CSO	-	Central Statistics Office (in Ireland)
DOES	-	Department of Education and Science (in Ireland)
ECTS	-	European Credit Transfer and Accumulation System
EU	-	European Union
HEA	-	Higher Education Authority (in Ireland)
HEFCE-		Higher Education Funding Council for England
HEI	-	Higher Education Institute
HETAC-		Higher Education Training Awards Council
ICT	-	Information and Communications Technology
IOT	-	Institutes of Technology
IT	-	Information Technology
KPI	-	Key Performance Indicator
LLL	-	Life Long Learning
LMS	-	Learning Management System
LOP	-	Learning Organization Profile
NQAI	-	National Qualifications Authority of Ireland
OECD	-	Organization for Economic Cooperation and Development
PDP	-	Personal Development Plan
PMDS	-	Performance Management Development System
SURF	-	Netherlands Research Body into ICT in Higher Education
SWOT	-	Strengths, Weaknesses, Opportunities, Threats
TAM	-	Technology Acceptance Model
TL&A	-	Teaching Learning and Assessing
TLA	-	Teaching Learning and Assessing (Tool)
VEC	-	Vocational Education Committee
VLE	-	Virtual Learning Environment

# Chapter I Introduction

## 1.1 Contextual Background

*“Everything has changed but our ways of thinking, and if these do not change we drift toward unparalleled catastrophe.” Einstein*

Information and Communications Technology (ICT) is now a mainstream component of how higher education institutes conduct their business in Western Europe. The interest in investigating this topic arises from such work as that described by Goldstein (2006) where respondents listed ICT as a top three change driver in higher education. This makes ICT the third most significant change driver in higher education presently.

In Ireland it is now normal practice to integrate ICT into all the main business activities of its Institutes of Technology. This study will examine how this integration is viewed in the IOTs in Ireland with respect to teaching, learning & assessment (TL&A), against the strategic framework of learning organization maturity.

In the integration of ICT, countries and higher education institutes engage with many different approaches. In some countries for example, there are national initiatives driving the integration of ICT into TL&A. In Ireland there is no one government originating strategy in this arena currently, similar to say that promoted by the Finnish government via the FVU using the TieVie program to have 75% of academic staff skilled in ICT by 2007. In Australia this type of policy initiative is provided by The Australian Information and Communications Technology in Education Committee (AICTEC) & the Education Network Australia (EdNA) for the Australian higher education sector. Writers on this theme have identified different models for the integration of technology into TL&A. For example Taylor et al. (1996) offer three possible implementation approaches in higher education:

- The *integrated approach* with a central unit managing the integration of teaching and learning with IT, emphasizing support for professional development in educational and information technologies and linking it to the institutes overall strategic goals.
- The *parallel approach*, creating an IT-based teaching and learning unit which operates separately and in parallel with existing staff development units.

- The *distributed approach*, which is more 'bottom up' and devolves responsibility for new IT-based teaching and learning initiatives to local innovators across a range of faculties and units.

It is important here to briefly frame the development and use of ICT over the last several decades in teaching learning and assessing in higher education and in particular in the IOTs the subject of this study.

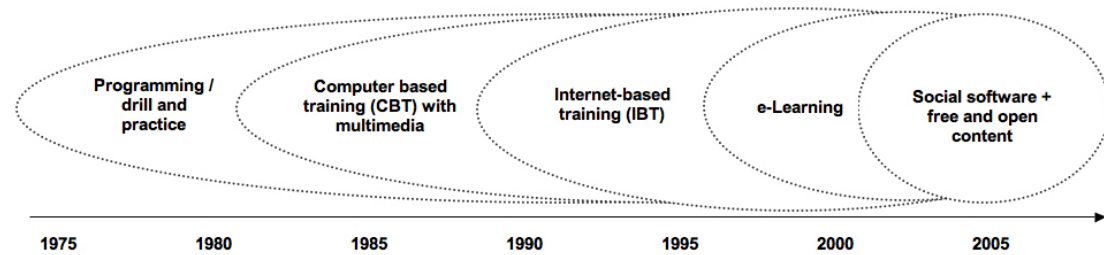


Figure 1. History of ICT in education (Leinonen 2008)

Leinonen's model in figure 1 captures well the evolution of ICT in TL&A in the IOTs. The various phases in the IOTs were:

- Programming drill and practice which would have used languages such as basic and pascal on hardware such as apple iie, ibm pc and bbc micro. This practice was located and still remains naturally within software engineering courses
- The CBT training with multimedia phase, with the development of a suite of applications such as word processing, spreadsheets etc was supported by standalone apples macs and ibm pcs.
- The Internet-based training phase happened in the IOTs in the mid-nineties with the investment in Ethernet LANs and the development of both HEANET (university based research network) and ITNET (IOT based research network) both of whom worked closely together to provide connectivity to the internet to IT lab desktops within higher education in Ireland.
- The eLearning phase of the evolution of ICT in TL&A in the IOTs occurred in the early years of the 21<sup>st</sup> century with the diffusion of products such as Moodle, Webct, and Blackboard etc.
- The IOTs are at the experimental stage of social software and free and open content phase with the trialling of web portals in some Institutes and the extension of eLearning offerings with podcasting and synchronous interactive forums in others. All students now have access of course to useful open source software and knowledge repositories such as Wikipedia.

Given Taylor's (1996) implementation approaches above it is now opportune to explore how these implementations and integrations manifest themselves in the IOTs in the area of teaching learning and assessing the focus of this study. In relation to teaching learning and assessing for academics in the IOTs there are several suites of software employed here. They are:

1. Student administration systems represented by a product called SCT Banner.
2. Daily work tools represented by Microsoft Office and Windows Explorer.
3. Learning Management System represented by products such as Moodle, WEBct or Blackboard with Moodle being the dominant implementation here.
4. Library Electronic Databases & Journals represented by Millennium Library System.
5. Discipline specific ICTs represented by various ICTs deployed at academic department level

This study does not concern itself with a detailed discussion on how these systems became embedded in the work practices of academics in the IOTs, similar to say works like those of Cornford & Pollock (2003) in the UK, but the discussion here is more in line with the work of Collis & Van der Wende (2002) as it will endeavour to establish models and measures of ICT use by academics. However it is worth unpacking these five appropriations of ICT in the IOTs in order to assist setting the context for this study.

Firstly the student administration system employed in the IOTs (SCT Banner) is an American generic higher education college administration system which was purchased by a central implementation body called An Cheim in the late 1990's. This system was rolled out to all 13 IOTs over the next 6 to 7 years. This implementation involved a major investment in ICT and replaced all bespoke and generic student administration systems which existed in the IOTs heretofore. This implementation could be categorized within Taylor's (1996) integrated approach. In the implementation phase the experience here for the IOTs was one where instead of the system fitting the organization, the IOTs were required to adapt their business processes to the particular ICT (Davenport, 1998; Light et al., 2001) in this case SCT Banner. The assimilation gap (Fichman and Kemerer, 1999, Gilbert & Kelly 2005) in these ICT appropriations could be said to be lengthy with the bringing on board of academics in relation to for example the entering of exam results into SCT Banner a long and protracted process which has only recently been completed.

The appropriation of daily work tools such as Microsoft Office is almost universal at this stage in IOTs where for example over 90% of respondents to this study indicated they use word processing in lecture preparation. This implementation could fit within Taylor's (1996) integrated approach. Davis et al (1989) perceived ease of use (PEOU) and perceived usefulness (PU) based on the technology acceptance model (TAM) would describe appropriation here. The process of appropriation from (Rogers 1995) innovators through to late majority to a point where these adoptions are now mature has transpired.

The appropriation of a learning management system (LMS) such as Moodle is widespread at this stage in the IOTs. For example in this study 100% of respondents indicated that they used an LMS as part of their lecture preparation. Taylor's (1996) distributed approach could be used to describe this implementation. In the LMS ICT adoption cycle in the IOTs traits of a bottom up (Uys 2003) approach are evident. The appropriation here initially by small groups of academic innovators in scattered departments deploying open source Moodle LMS on small Linux servers to a systemised deployment of the same technology by central computer services in the IOTs over time is in evidence. This type of appropriation from within seems to generate less resistance to acceptance than say the experience of the SCT Banner project.

The library system employed in the IOTs is Millennium an American generic higher education college library system which was purchased by a central implementation body called An Cheim in the late 1990's. This system was rolled out to all 13 IOTs over the next 6 to 7 years. This implementation involved a major investment in ICT and replaced all bespoke and generic library systems which existed in the IOTs heretofore. This implementation could be said to be commensurate with Taylor's (1996) integrated approach. In this implementation the experience here for the IOTs would be one where instead of the system fitting the organization, the IOTs were required to adapt their library business processes to Millennium (Davenport, 1998; Light et al., 2001). The assimilation gap (Fichman and Kemerer, 1999, Gilbert & Kelly 2005) in the case of these ICTs could be said to be reasonable as compared with the student SCT Banner system as library staff were engaged as stakeholders from the start of the project and they already had been used to working a computerised system in all cases. Davis et al. (1989) perceived ease of use (PEOU) and perceived

usefulness (PU) based on the technology acceptance model (TAM) would have had relevance here.

The appropriation of discipline specific ICTs such as for example Pro-Engineer in engineering departments are common at this stage in the IOTs. Taylor's (1996) distributed approach shows best fit with this implementation. Davis et al (1989) perceived ease of use (PEOU) and perceived usefulness (PU) based on the technology acceptance model (TAM) would describe appropriation here. The widespread appropriations of these types of ICTs are heavily influenced by the student stakeholders of the IOTs requirements for skills in these technologies in the workforce.

Many major studies, such as those by Collis and van der Wende (2002), the Seusiss Project (2003) and Kop et al (2004) in Europe, Hawkins et al (2005) in the US and Kearns (2002), which has a global perspective, have examined the effectiveness of the integration of ICT into higher education organizational processes in detail. Their findings will be explored further in the literature review chapter of this study. Overall these analyses provide a mixed picture of the effects on educational outcomes of the integration of ICT into TL&A. A lot of these reports point to the requirement for continued research into this area. Researchers such as Collis and Van der Wende (2002) found a disjoint between perceptions of policy and strategy makers and those employing ICT in delivery of higher education at the chalk face. The perception from students particularly from the Seusiss Report (2003) was that there was little or no ICT skills development in their programs of study.

In the literature there are some radical approaches mentioned in relation to the integration of ICT into TL&A. Scott (2000) for example, describes the scenario form Carnegie Mellon University where it was suggested that the traditional academic would be replaced by electronic tutors in the future. However, most reports agree that in the main a blended approach to the use of ICT in TL&A will prevail.

In the exploration of the integration of ICT into TL&A, evidence of best practice will be sought both from the policy / strategy and the levels of integration perspectives. First, the paper will give a brief outline as to the development of the IOT sector and where it sits within the higher education landscape of Ireland currently, in order to set the context for this study.

## **1.2 Institute of Technology (IOT) Sector in Ireland**

The higher education sector in Ireland is made up of in the main two types of higher education institutes i.e. universities and IOTs. In more recent times some private third level institutes have emerged mainly in the Dublin region. The Higher Education Authority (HEA) has traditionally been the funding body for universities and recently has become the funding body for the IOTs. This study is focused on the IOT sector.

However it is important as a preamble to explore some of the current thinking into what the writer understands an IOT to be in the context of this study. Fundamentally the IOTs are coming from a base where Oswald (2002) would describe them as teaching institutes i.e. institutes where the primary role is teaching where little or no research activity existed in the early days of their existence. In recent years there has been a greater emphasis on applied research in the IOTs.

Ireland has a binary higher education system, which developed over time to meet the needs of the various academic attainments of those student cohorts completing second level education and to serve the needs of the economy transforming from a mainly agricultural to a more industrialized base. Within the sector universities are mainly concerned with undergraduate and postgraduate programs to PhD level and beyond together with basic and applied research. The IOTs are mainly concerned with undergraduate programs, together with some post-graduate programs. IOTs are mainly involved with applied research and have strong regional links with industry in their locales. The IOTs were founded in the early nineteen seventies, whereas the university sector in Ireland has been in existence for a number of centuries. IOTs were initially called Regional Technical Colleges. There were ten such colleges established at first in the early nineteen seventies. This number has increased to thirteen IOTs recently, with new additions in the late nineteen nineties in the Dublin metropolitan area. The IOTs vary in size from 1,000 to 8,000 students. These are strategically located geographically throughout the country.

The Regional Technical Colleges (former name for IOTs) were introduced to cater for students who heretofore did not have an opportunity to enter third level education, in an effort to provide graduates to support industrialisation of the mainly agricultural economy of the nineteen seventies in Ireland. They were administered by local government agencies called Vocational Educational Committees (VECs), which also controlled and still does second level vocational schools. In the main in the early



stages the IOTs engaged in vocational training to technician level via nationally awarded certificates in domains such as business and accountancy, science, construction, mechanical and other engineering disciplines.

Over the last ten years major change in the third level sector in Ireland has occurred, in particular in the IOT sector. In the nineties the IOT sector moved from local authority funding (VECs) to central government funding from the Department of Education & Science (DOES) through changes in legislation under the 1992, 1994 & 1999 Regional Technical Colleges Acts. The latter Act changes the name from the Regional Technical Colleges to the Institutes of Technology. Since the name and increasing autonomy during this period also the IOTs have moved from institutes with little or no self awarding capacity to a situation where self awarding predominates up to honours degree and in many case to postgraduate level in 2008. The funding source, for the IOT sector, has recently changed once more, from Department of Education & Science (DOES) to the Higher Education Authority (HEA), the body which currently funds the university sector in Ireland.

The governance structure of an IOT starts with governing body (statutory) which comprises the chairman of the governing body, the president, the secretary/financial controller, 5 staff representatives from both academic and non-academic functions, a student representative, representatives from local VEC groups and representatives from local industry and an external union representative. This group meets regularly throughout the year to discuss governance issues such as for example policy and the sanction of posts which have been validated through the human resource process.

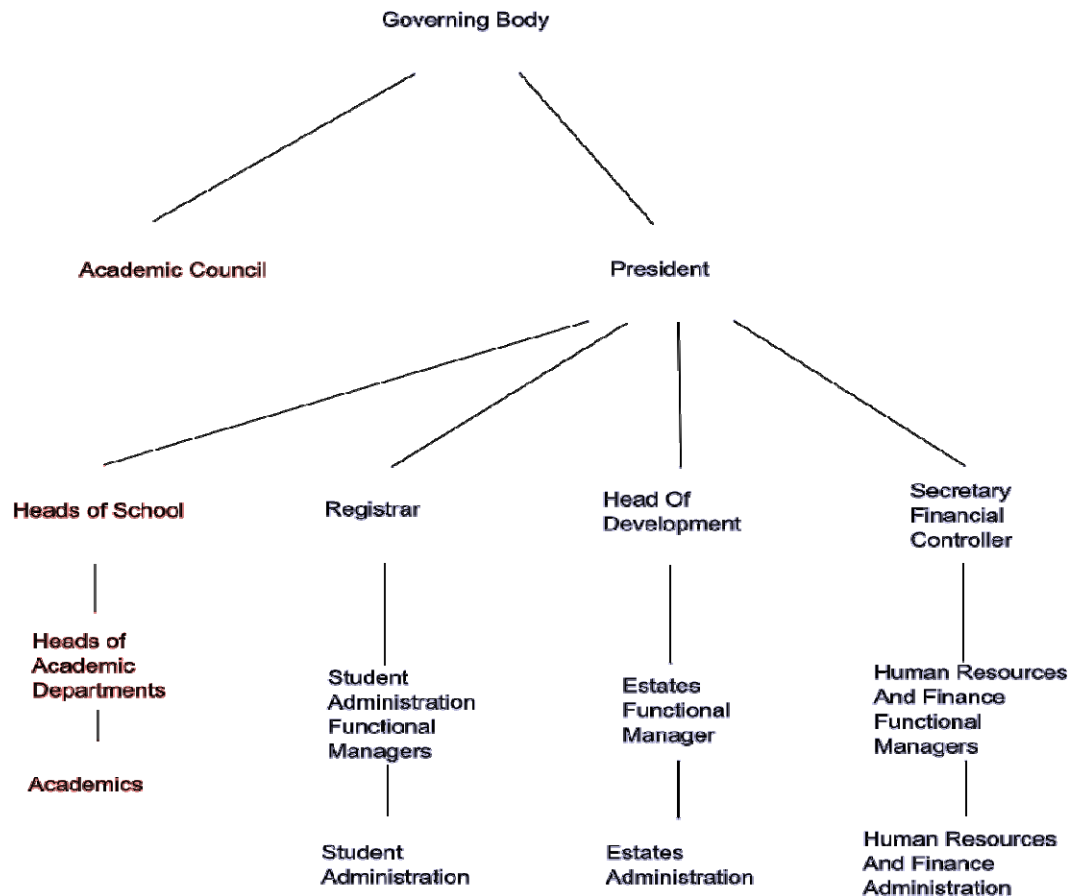


Figure 2. Typical IOT Structural Diagram

The second significant group in figure 2 above is the academic council (statutory) which contains representatives of senior management including the president and the registrar and academic management and faculty representatives from each school along with student representatives. This group discusses the academic business of the institute in relation to student welfare, teaching, learning and assessing and research and is obligated to make recommendations to the governing body in these matters. It is supported by several subcommittees for example student services which discuss student welfare issues and report regularly to the academic council. The third important grouping of the IOT is the senior management group (non-statutory) which meets regularly to discuss and decide on strategy and operational matters. The senior management group comprises the president, heads of school, secretary/financial controller, registrar and head of development and other invited members of management and non-management staff when required.

The culture on the administration side of the IOTs resembles that of a modern bureaucracy (Shore 2008). Here the rise of managerialism (Deem 2001) allied to an

increasing 'audit culture' (Shore 2008) driven by external stakeholders such as the Irish government, and the Higher Education Authority (HEA) is in evidence. Similarly the academics in the IOTs are being increasingly exposed to Shore's (2008) 'audit culture' where external stakeholders via the administration avenue allied to the demands for audit from professional bodies are impinging on their spirit of collegiality and academic freedom leading to what Sarles (2001) describes as the rise of renewed pragmatism. Shore (2008) also relates concern about the lack of resistance to or questioning of the 'audit culture'.

Change and renewal in the IOTs as in many organizations starts with environmental scanning (Mintzberg 1994), which is filtered via senior management and administration to academics a top down approach or in meetings between academics and management a blended approach or via academics a bottom up approach. From these initiatives with the approval of senior management new programs are developed within departments mainly, with environmental surveys completed to confirm demand and sustainability. These new programs are then progressed through the registrar's office where a board of external academic and professional experts is established to interview the new program creators for verification of academic quality and complicity with HETAC and NQAI standards where required. The new program is then passed to academic council for approval. Where additional resources for example new posts are required this is sanctioned by senior management and the governing body ultimately, prior to the launch of the new program. In the development of new programs the IOTs learn from their environmental scanning (Mintzberg 1994) and from informal communities of practices (Wenger et al 2002) which may be within departments, interdepartmental or inter-institutional.

The IOT sector main staffing categories will be described next. In the main the IOT sector of higher education in Ireland is strictly unionised with four main union segments and cohorts of staff as follows:

- Academics – Teachers Union of Ireland (TUI)
- Administrator – IMPACT & SIPTU
- Technical support staff – AMICUS & SIPTU
- Other support staff – IMPACT & SIPTU

In recent years significant efforts have been made at cultural change in order to encourage the IOTs to migrate from adversarial union/ management public sector industrial relations model towards a more team based partnership approach. Attempts to mainstream this transformation are evidenced in the recent partnership initiative in the IOT sector. This partnership approach formed part of recent national wage agreements in Ireland. In this, significant investment was made in training for both staff (unions) and management for the deployment of projects within the organization, on a consensus basis. This process, called the Performance Management Development System (PMDS), started with small easy to manage projects, with the hope of systemizing this approach to all mainstream projects within the IOT sector going forward. Although pilot projects worked well it is too early to say whether systemization will ever come to fruition.

In this partnership arrangement, a committee entitled the Industrial Relations (IR) forum consisting of union and management representatives, discuss, agree and complete progress reports towards organizational transformation. A lot of the projects involved here relate to engaging in the use of new technologies. This approach had some similarities with Drucker's (1993) team based approach. However not insignificant strides have been made through this process in developing teamwork and tackling cultural change even in the Integration of Information and Communications Technology (ICT) into Teaching and Learning and Assessment (TL&A) where for example more flexible modes of delivery are seen as significant elements of the partnership agenda.

To a large extent the heightened activity in strategic planning in the IOT sector has been driven by outside stakeholders, these being in the main the government, the EU and the OECD. This is because strategic planning and strategic goals achievement has become an integral part of national wage agreements as part of efforts to improve efficacy and productivity in the public sector in recent years and again in the latest agreement completed in 2006 called 'towards 2016'.

Recent reports such as OECD (2005) into higher education policy in Ireland acknowledge that investment in higher education is reasonable but stresses the need for modernisation of management in both universities and institutes of technology in order to ensure efficient outcomes for this investment. OECD (2005) also recommends that institutes ought to be funded through a contract against an agreed strategic plan which will significantly increase accountability on performance. This

again is concrete evidence of external driver influence towards the modernisation of strategic planning in the sector.

To address this need for modernisation, government sponsored managerialism (Deem 2001) is on the march in higher education in Ireland. This is in part being affected by a move in national government towards viewing private sector practices (Meek 2003), as a way of improving efficiencies in the public sector. This emphasis on the increasing use of private business practices in the public sector in Ireland is being leveraged in the main by a small right wing minority government party which has been in coalition government throughout the early part of the 21<sup>st</sup> century. This trend is particularly evident in Ireland where in recent years many nationalised industries such as telecommunications, Eircom and air travel, Aer Lingus have been privatised. In the IOT sector managerialism started with the move to central government funding through the Department of Education & Science (DOES) from local government Vocational Educational Committee (VEC) funding in the mid 90s.

In addition during this period older presidents (leaders) of the IOTs have gradually been replaced, by new directors / presidents on ten year contracts. These new leaders have propagated managerialism by employing professional administrators in areas such as HR, Finance and ICT with many appointments arising from personnel with private sector experience. This has created tensions with traditional administrators and academics in the sector. In addition, in some cases academic heads of departments and schools have been appointed straight from industry. Collegiality and the 'academic heartland' (Clark 1998) is being affected by these changes and morale among many academics who viewed such posts, perhaps, as part of their career path is thus dented. 'Managerialism' and major change are even more prominently in evidence in the Irish university sector where massive restructuring, under new leaders, is making national newspaper debate on a regular basis. So as Nicoll (1998) describes it, higher education in Ireland is in the midst of "technologization, marketization and managerialism". One could also add globalization to this triumvirate.

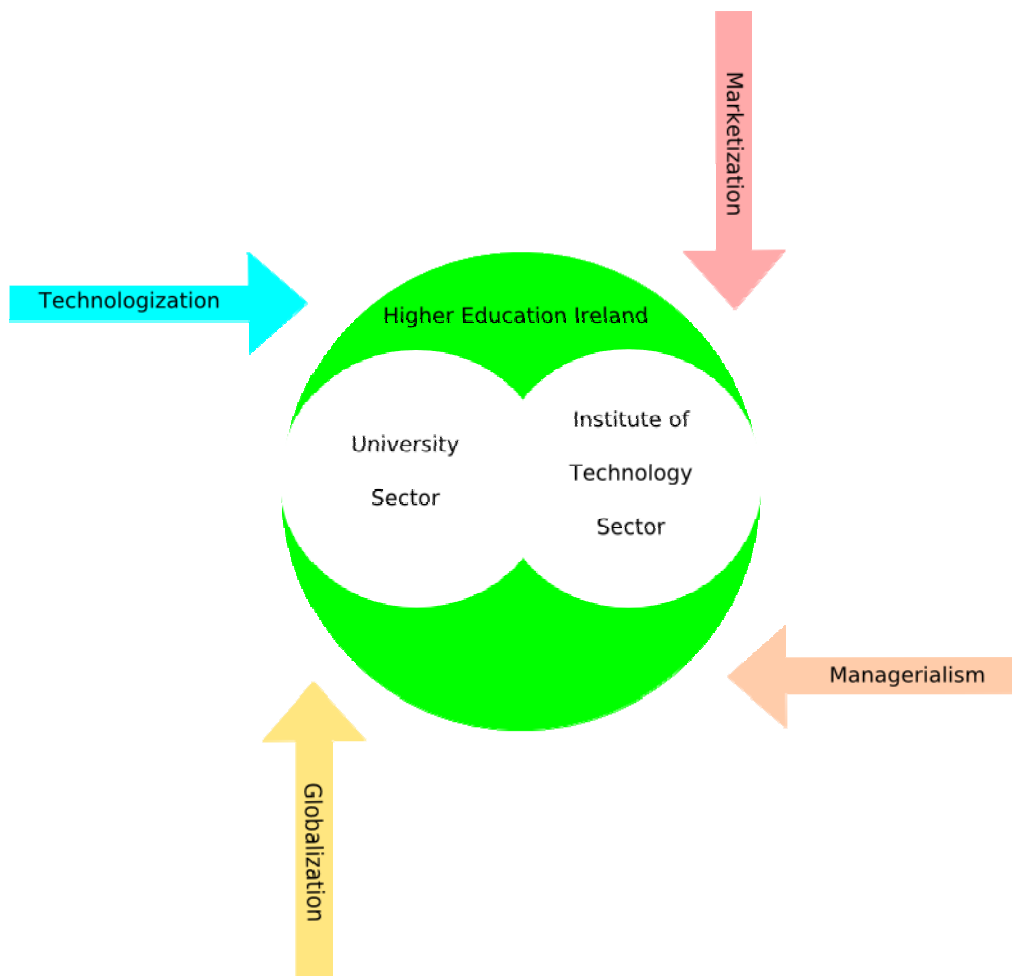


Figure 3. Irish Higher Education Environmental Drivers

This study will focus on the “technologization” theme in figure 3 above. However, to render the context the other themes of marketization, globalisation and managerialism, and their impact on and interactions with technologization need to be taken into consideration.

Although the IOT sector started out as 10 identical organizations (now 13 IOTs) which still maintain a large amount of commonality, in recent times there is increasing evidence of diversity between entities in the varying strategic themes being pursued by different IOTs. For example one IOT might engage with the strategic focus of attracting foreign students and thus take the lead in the sector in internationalism, another might follow the theme of academic excellence and thus consistently score well on league tables under this parameter, while a third might demonstrate the strategic intent of completely distancing itself from its peers by embarking on the road to becoming a member of the higher tier university sector.

In this brief description of the evolution of the IOT sector there is major evidence, as Garrison (1989), Paul (1990) and many others contend, of institutes exhibiting many characteristics of bureaucratic organizations. Clark (1983) divided higher education institutes governance into three main types. The bureaucratic model of governance is shared by government/political appointees and representatives of academia. This might equate well with governing bodies of the IOT sector institutes. The collegial model shares power between representatives of academia and trustees and administrators, and the market model of governance is one in which the balance of power is more favourably weighted on the side of trustees/administrators rather than representatives of faculty. The governance model of the IOT institute, although showing best fit in Clark's (1983) bureaucratic envelope, may be liable to change and may display characteristics of other model types, mainly due to the more recent influence of managerialism.

### **1.3 Focus of Study & the Research Question(s)**

The objective of this study is to examine how strategic focus measured against a framework of learning organization maturity relates to the integration of ICT into TL&A in the subject institutes. Before we move on, it is important to pause and consider which definition of ICT in TL&A best reflects the study's objectives in examining the integration of ICT. One such definition which fits well with this study is that quoted from an OECD (2005, p 21) report.

*“...the use of information and communications technology (ICT) to enhance and/or support learning in tertiary education. While keeping a presiding interest in more advanced applications, eLearning refers to both wholly online provision and campus-based or other distance-education provision supplemented with ICT in some way”.*

The study is not simply interested in focusing on the eLearning in the IOT sector in Ireland, but rather investigating the integration of ICT into TL&A in a broader sense, as there is little research available in Ireland on this subject to date.

At this juncture it is important that the study gives a preamble on how the writer interprets the idea of learning organization maturity. This discussion will be further elaborated on in chapter 3. Senge (1990) describes the learning organization as one where:

*‘..people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together’ (Senge 1990, p. 2).*

While Garvin (1993) suggests a learning organization is:

*“..skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights” (Garvin, p. 80.)*

Intuitively these organizational descriptions would put in mind a utopian vision of a higher education institute. This study interprets learning organization maturity in the IOT sector as a construct where a context exists in which learning at individual, group and organizational level coexists freely without interference from power or politics. Whereas Vince (2001), Blackler and McDonald (2000) and others concentrate on emotion, power and politics or if you wish the cultural (Nyhan et al, 2004) aspect of the learning organization debate, this study is more focused on the structural (Nyhan et al, 2004) aspect of this debate. The study endeavours to achieve a measure of this construct in the IOT sector.

The study will also look at the level of integration of ICT into TL&A from an academic perspective. From this the study will attempt to explore interactions between strategic focus against a learning organization maturity framework, and the level of integration of ICT into TL&A. Finally, an effort will then be made to correlate variables / results which emanate from an analysis of strategic focus based on a framework of learning organization maturity with variables / results defining effective integration of ICT into TL&A. The main research question which prompts this approach is:

*Is it possible to correlate, the identification of learning organization maturity, with the level of integration of ICT into TL&A in the IOT sector in Ireland?*

Sub-questions that arise here are.

1. Is it possible to establish learning organization maturity for individual institutes and the IOT sector as a whole?
2. Is there anyway to compare findings in learning organization maturity with other studies in this area?



3. In establishing the learning organization maturity of the subject institutes are there differences or similarities in learning organization maturity views between the various stakeholder groups studied?
4. Is it possible to establish the level of integration of ICT into TL&A?
5. Is there anyway to compare the findings on the integration of ICT into TL&A with other studies in this area?
6. In establishing the level of integration of ICT into TL&A are there differences or similarities in the integration of ICT into TL&A views between the various subsets within the data?
7. Do institutes presenting high levels of learning organizational maturity display successful ICT integration into TLA?

In order to achieve answers to the research question, and the sub questions that arise from it, the study will proceed as follows.

In Chapter II the study will progress to the examination of what is perceived in the literature as successful integration of ICT into TL&A in higher education. Next the study will attempt to ascertain what type(s) of organization demonstrate best practice in ICT strategy as part of their overall strategic intent. A conceptual framework in how to measure successful integration from a number of aspects gleaned here should evolve. Some of these aspects may include

- Completeness of integration i.e. how much ICT academics employ in preparation delivery and assessment in their work.
- Depth of integration i.e. where does the integration lie along a continuum from for example from PowerPoint in the classroom through to the complete online course.

Graves (2001) suggests that where academics achieve an appreciation of ICT in their work practices, they can use ICT to extend, rework and innovate their research and teaching contexts. The literature may assist the writer in identifying a tool to gather the data sets pertaining to the ICT integration theme. Where a tool or model to be used for this part of the empirical work in this study does not emerge it may be necessary for the writer to investigate the development of such a tool. The literature review may reveal a lack of specificity to enable a coherent framework for measuring success. Thus, the process in arriving at this conclusion will be integral to, and indeed may be regarded as one outcome of the study.

In Chapter III the approach will be set out as follows. Primarily the writer will undertake a literature review into the key areas of the study around the learning organization maturity framework. Here the study will build on the examination of strategy development in Chapter II and focus on the learning organization framework as the main comparator to be employed in the study. Chapter III will examine the current themes of strategic process, based around Argyris and Schön's (1978) writings on organizational learning and on Senge's (1990) theory and practice of the learning organization. From this literature review, it is hoped to build a framework around the area of strategic process based around a learning organization maturity theme, given its suitability to a fluid environment, its contribution to change management and its questioning of traditional organizational culture. From this discussion the study should establish whether a learning organization maturity approach might result in more successful implementations. This argument can then be advanced as a benchmark for analysis of the data gathered from the IOT sector, as part of the study. Here themes may emerge which will underpin the development of a questioning framework which will identify similar themes in the subject institutes being examined. A tool will then be developed for the purpose of gathering data on these strategic themes against a framework of learning organization maturity.

Allied to a thorough examination of the specific aims of the study in the literature review, it is necessary to provide a critical assessment of the reasons why there is such a wave of emphasis on and investment in the integration of ICT in TL&A at this time. This assessment should provide a more holistic feel to where the study fits in the body of research in this field. This assessment is prompted by something as fundamental as Article 26 of the Universal Declaration of Human Rights:

*"(1) everyone has the right to education. education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit."*

The point here is that perhaps the integration of ICT into TL&A may prove significant in realising the aim of this article. The study will explore strategic thinking in relation to the integration of ICT into TL&A. The thesis having examined various themes on strategic thinking, will attempt to arrive at a 'best practice' framework for the investigation of strategic process relating to the integration of ICT into TL&A. The

study also wishes to examine the integration itself, from the perspective of academics, and how effective this integration may be in the IOT sector in Ireland.

In Chapter IV the approach will be set out as follows. A methodological approach will be set out as to how data will be gathered and how the study will progress to the analysis phase. Here the research design arising from the disquisition in Chapters II and III will emerge. Principally from the strategic perspective, a questionnaire will be designed or a tool may emerge, via the literature review, to elicit data which reveals characteristics or traits of learning organization maturity. These types of questions will be addressed to all survey subjects, which in this study, includes both academic and non-academic management and academic staff. Questions to determine the level of integration of ICT into TL&A present in the IOT sector will also form an adjunct to the academic staff's survey instrument.

In Chapter V the approach will be set out as follows. Initially the findings will be tabulated and analysed and posited against the research question and sub questions. This chapter will then correlate learning organization maturity results with the levels of ICT integration into TL&A in the institutes of technology.

In Chapter VI the approach will be as follows. Reflection will take place into the methodological approach to the study. A brief description of the limitations of the study will be delineated. Next some discussion on conclusions will follow. Here reflection will take place on what has emerged from the study. This may lead to some further analysis of the data in order to answer resultant questions. Finally, these reflections may assist the identification of pathways, to further research opportunities in this domain.

## Chapter II Strategic Thinking & ICT Integration

### 2.1 Introduction

*"When planning for a year, plant corn. When planning for a decade, plant trees. When planning for life, train and educate people."* Chinese proverb: Guanzi (c. 645BC)

Chapter II explores some of the literature on strategic thinking, in order to get a better understanding of strategic frameworks relating to the integration of ICT in higher education organizations. The disquisition will explore topics such as the evolution of strategic thinking, management, leadership and student stakeholder issues. The disquisition will also discuss environmental factors affecting the institutes of technology ICT strategies and models on ICT integration. The identification of successful integrations and how these are measured will form part of this review.

First off, the evolution of strategic thinking will be briefly traced from its roots in the early part of the 20<sup>th</sup> century to current thinking. Next, the study will briefly look at leadership and management, in the context of higher education around the deployments of innovation. In any study which focuses on strategy within organizations it is important and necessary to include some analysis around leadership. Next the impact of ICT strategies on the student stakeholder will be discussed. The student, even though he/she is not part of the empirical phase of this study, is a necessary integral part of the context, as improved service to them ought to be the main trust of the IOTs strategies. A review of environmental factors affecting ICT integration strategies will next be delineated. Following this, the chapter will look at models and approaches, while exploring examples of both theoretical frameworks and actual strategies on the ground in an effort to get a better insight into the subject. Finally a short summation of what was found in this chapter is presented.

### 2.2 Strategic Thinking

Strategic planning has evolved over the course of the 20<sup>th</sup> century, with its beginnings in the early part of that century. However, this development accelerated after the Second World War, where a vacuum, created by the war, inspired a period of mass-industrialization. Writers like, Ansoff (1979), Drucker (1993), Handy (1990), Steiner (1979), Porter (1996), Mintzberg (1994) and many others led the way in these developments. Their writings engage with topics ranging from 'Strengths

Weaknesses Opportunities and Threats' (SWOT) analysis through to complex dissertations into subjects such as 'systems thinking' and 'learning organization maturity'. Modern strategic planning initially developed in the Department of Defence in the US in the 50's and 60's through their planning program budgeting system (PPBS) as described by Young (2001). Out of this process, concepts like zero-based budgeting and management by objectives emerged. Over time the writers on strategic planning have come forward with many definitions and models. In these myriad of models some common themes have surfaced including:

- Vision — Developing a common “vision for the future” or a “conceptualization” of where an organization wants or desires to be in the medium to long-term.
- Assessment — Appraising or determining where an organization is currently by examining its environment and analyzing its goals, objectives and achievements.
- Strategies — identifying how an organization will actually achieve its mission, goals, and objectives, via detailed plans and actions.
- Measurement — Evaluating the progress of an organization in the implementation of its action strategies and recursively cycling through these themes in a deliberate manner to re-adjust direction where and when necessary.

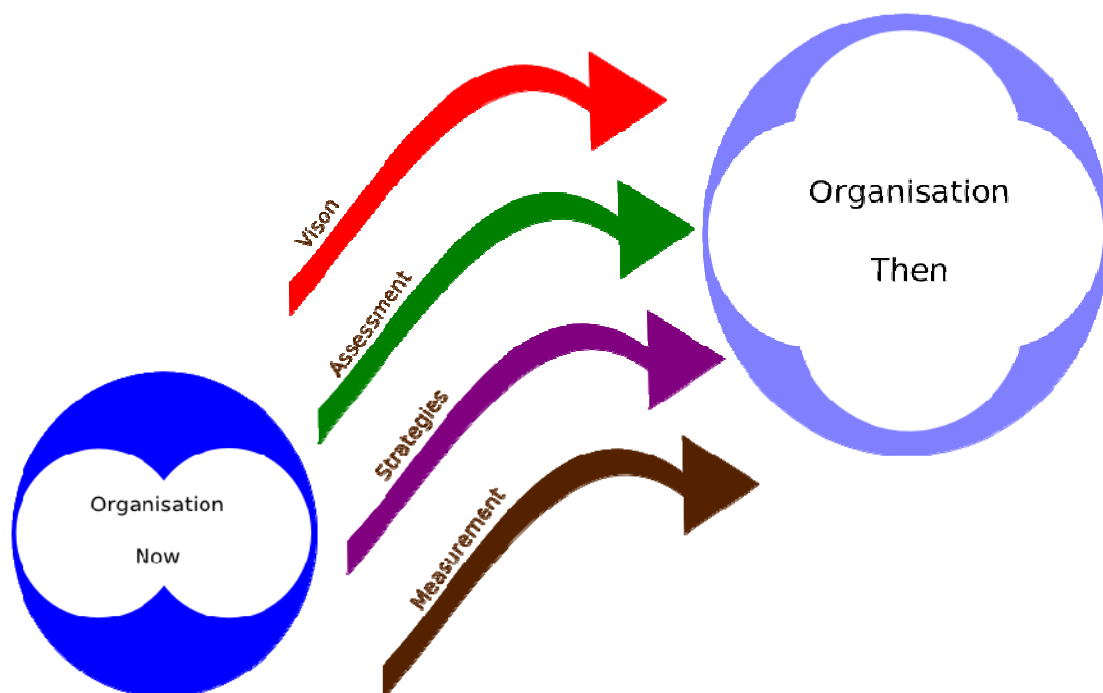


Figure 4. Strategic Planning Themes

These commonalities arising from strategy literature are depicted in figure 4, above.

<i>School</i>	<i>View of Process</i>
Design	Conceptual
Planning	Formal
Positioning	Analytical
Cognitive	Mental
Entrepreneurial	Visionary
Learning	Emergent
Political	Power
Cultural	Ideological
Environmental	Passive
Configurational	Episodic

Figure 5. Source: Henry Mintzberg (1994).

Mintzberg (1994) contends that there are 10 schools of thought associated with strategic planning (see figure 5 above). Design, Planning, and Positioning are connected and they represent the main themes of a template describing how strategic planning should be carried out. The Design and Planning Schools are similar, the main difference being that the Planning School is more operation orientated in its processes than the Design School which is more conceptual. Both are essentially SWOT analyses and, therefore, they fit within the assessment theme of strategic planning. The Positioning School is more analytical and focuses on specific strategic threads with detailed examination of empirical data both internal and external to the organization.

The remaining seven schools of thought, Mintzberg (1994) allows, are in the main descriptive. That is to say, they are strategic approaches or viewpoints that take on thematic interpretations. For instance, Mintzberg describes the Cognitive School as one which focuses on processes which recognize the importance of the environment. The Entrepreneurial School of strategic planning is centred on a spiritual leader who demonstrates and articulates a vision for the future. The Learning School places emphasis on collective or collegiate spirit similar if you like to elements of Senge (1990), Pedler et al (1997), Marquardt (2002) and others ideas on the learning organization. The other schools in brief which demonstrate the main strategic processes are political with a focus on power rather than on cultural issues. In the higher education context this may be actualized where managerialism (Deem 2001) might predominate over a collegiate spirit. The Environmental school is indicative of

an organization which is strategically outward facing. The Configurational school is aligned with the configuration of strategies in an organization to help transformation and change at certain intervals.

Why is the question of strategic intent important in the context of this study? In recent times there has been major investment in ubiquitous computing (Hawkins et al, 2005, Smith 2003, SURF 2004, Weckmann & Engert 2005) in the IOT sector into administration, classrooms, labs and student open access areas which continues apace currently. It is opportune at this juncture to unpack what the analogous terms 'ubiquitous computing' and 'the ubiquity of computing' mean in the context of this study. Here the writer means, as indeed Smith (2003) describes it, as the academic staff having access to a networked computer to assist with their work in teaching, learning and assessing. This study is interested in the level of use of ICT in relation to an academic's work in the IOT sector and not how these ICTs were introduced.

Therefore it may be time to reflect on these interventions to ascertain whether the premise justifying these investments, in the first place, meets the strategic intent of the IOTs. This investment started with a major surge in undergraduate numbers on ICT courses in the first few years of the 21<sup>st</sup> century driven by a burgeoning dot.com industry need. Over the last couple of years there has been a serious decline in these numbers mirroring if you like the .com fallout in the industry.

Now, as an orientation the study describes how a number of higher education institutes go about including ICT elements in their strategies. ICT elements were examined from a sample of TL&A strategies across higher education institutes such as Queen Mary's College London, Liverpool John Moore's University, Edinburgh, Westminster, Dublin IOT, Dun Laoghaire IOT and others. These sample cases were selected randomly within the British and Irish contexts, where explicit strategies on the theme were easily accessible. Only in some is the ICT Strategy integrated into the TL&A strategy which in turn is integrated into Institutional Strategy, which in turn refers to regional, national and international influences.

Samples from the strategies illustrate the following approaches:

- Efforts are made to exploit the potential of new technologies to facilitate flexible approaches to learning

- ICT is to be used for the support of non-standard intake such as distance learners and part-time learners i.e. delivering on the widening participation agenda.
- ICT will provide a wider range of learning opportunities which better suit a variety of learning styles.
- ICT will somehow enable an institute to become a modern forward looking organization.
- The priority in on-line approaches in pedagogy is in the use of blended learning, in order to add an extra dimension to on-campus delivery.
- The University Virtual Learning Environment (VLE) is recognized as a key component in the delivery of courses and modules. This will be used to provide administrative support and to store teaching materials, in addition to its use for interactive delivery of learning as appropriate to the particular modules learning outcomes.
- Students are supported in developing the learning skills required of successful higher education study.
- The University is committed to the continuous professional development of all academic and support staff in relation to teaching, learning and assessment, and discipline-specific expertise.
- In order to move towards a student-centred learning environment, standards need to be established for all existing and emergent learning opportunities available to students including eLearning
- The key message is that students are now entering college with ICT competence and expect to operate in an ICT-mediated environment.
- The University actively encourages and promotes the appropriate use of Information and Communication Technology (ICT) in teaching, learning, assessment and aspects of academic administration.
- ICT is used to underpin an innovative and responsive learning environment and to provide electronic access to learning materials and library resources.
- On-line approaches to pedagogy are primarily of a blended learning nature where the ICT provision, utilising the VLE, supplements face-to-face delivery and enhances the quality of the student experience.
- Rationale: this enabling theme is concerned with exploiting new learning technologies in relevant and appropriate ways in order to enhance learning, teaching and assessment. The theme recognizes that the shift towards greater use of ICT in student learning brings with it a requirement for staff to



have the requisite skills and understanding in order to exploit the huge potential of ICT in interactive learning.

Coleman & Laplace (2002) state, that the knowledge economy is placing a premium on innovation, customization and new ways of organizing work. In order to succeed and survive in this new environment, individuals and organizations must continually acquire new skills and new ways of managing knowledge and information. The mention of ICT, the actualisation of what Coleman & Laplace (2002) allude to, in these types of documents is certainly a recent phenomenon. Many universities set far from minimalist standards for students and staff in the integration of ICT into TL&A, as evidenced for example in the University of Edinburgh's strategy statement.

ICT skills which the University of Edinburgh will regard as core for all categories of students, undergraduate and postgraduate, should include:

- ability to use a wide range of the features of a modern word processor and presentation manager and to create and
- update their own database of references
- ability to use computer-mediated communications (CMC) both in the form of 1:1 electronic mail and also collaborative group-work tools ('conferencing') to support interactions with students and staff both on and off campus
- ability to access and make effective use of both local and distant library and bibliographic reference sources
- ability to retrieve and critically evaluate specific information from the World Wide Web
- ability to design and mount simple web pages
- ability to manage the interaction between all of these activities
- understand how to manage independent learning using ICT amongst other methods, so as to be better prepared for lifelong learning

Most of the strategies examined, appear to be once off documents with little indication of a strategic review or update cycle. This was evidenced by the lack of sign off or review dates attached, with some plans appearing out of date by some time. The absence of a rolling strategy may indicate that outcomes have not been measured and thus problems are not being addressed in newer strategies i.e. no

organizational learning appears to be taking place. Iteration and continuity, as described by Dolence (2003), are obviously missing from many of the strategic documents viewed. This may imply divergence between what actually happens in reality on the integration of ICT into TL&A and what is documented.

In any analysis of strategies around the integration of ICT into TL&A, strategic intent is important. Hamel and Prahalad (1994), Gouillart (1995), Hax & Majluf (1996), Liedtka (1998), and others discuss strategic intent from the perspective of how it may be utilized, to encourage staff to buy in to the long term strategic vision of the organization, and thus secure their commitment to delivery of their organizations' vision for the future.

Moving to the field of higher education, strategic planning with many models being imposed from the business world (Meek 2003) goes to the core of how a higher education institutes are now operating. In the extent to which facets of the IOTs operations are in keeping with the organization's overall strategic intent will be explored. For example one strategic theme might entail sustaining a mission-oriented assessment system focused on learning. This may entail new CPD training for academics in assessment methods. Allied to this the organization's leaders should be familiar with research findings and best practice in assessment methods and learning style information.

Here the discussion briefly seeks to identify differences or similarities between the IOTs and other organizations such as those in private business. Heretofore IOTs were in the main publicly funded not for profit organizations. However in recent times they have attempted to diversify their funding sources through in the main three avenues.

- Self funding adult and evening courses
- Enrolment of overseas non-EU fee paying students
- Annexing of research grants through successful submissions.

These initiatives indicate that IOTs are beginning to embrace the idea of the 'the entrepreneurial university' which is extensively discussed in the literature for example in Clark (1998), Duderstadt (2000) & Etzkowitz (2008). The drivers behind these diversifications are the need for independence in strategic direction prompted by Deem's (2001) managerialism in addition to globalisation and the uncertainty of increased public funding in the current economic climate into the future. The IOTs because of there short history and legislative remit have always been aware of their

role in the “triple helix” of industry government and higher education, as described in Etzkowitz (2008). In the past they may have operated strictly as publicly funded organizations. However the increasing influence being applied by stakeholders such as students, government, taxpayers and regional and local authorities actualised by Shore’s (2008) ‘audit culture’ demands increasing flexibility and transparency in IOTs operations. Steck (2003) suggests the change in the balance of power between academic values and stakeholder values needs to be carefully managed. Sotirako (2004) refers to this phenomenon as ‘*value conflict*’ i.e. the struggle between the maintenance of a free and open space for academics for the production of new knowledge and the increasing pressure on this space posed by managerialism (Deem 2001) and the ‘audit culture’ (Shore 2008). The literature suggests that IOTs ought to embrace this agenda intelligently in order to stave off becoming mere *institutional functionaries of the technological system* in society (Stivers 2006).

Throughout the evolution of strategic thinking higher education institutes have attempted to adopt many of the emerging business models which have been described by theorists such as Mintzberg (1994). However differences in governance, organizational structure, decision making mechanisms and expectation (Lerner 1999) have led to resistance to and rejection of many of these business models by the higher education sector.

Dolence (2003) advises that some of these models, for example, such as those developed by Cope (1989) and Bryson (1995) have had some success in higher education. Dolence’s (2003) curriculum centred strategic planning model develops strategic planning from the perspective of the core business of higher education. This model encouraged iteration and continuity in strategy development as part of the process. It employs elements of business models such as, key performance indicators (KPIs) and strengths, weaknesses opportunities and threats (SWOT) analysis, developed by Humphrey in the 1960s at Stanford University. There are also some elements of the learning organization theme, as described by Argyris and Schön (1978, 1996), in that single loop learning takes place and a learning centred curriculum approach is described. There is little empirical evidence to date where Dolence’s (2003) curriculum centred strategic planning model has been adopted and evaluated and whether it may be more applicable in the US higher education context rather than the European one.

In the debate on strategic approaches to the integration of ICT into TL&A, Weckmann & Engert (2005) in their paper 'a Strategy for the Transition to the E-University' on the University of Duisberg-Essen found that eLearning is not just another way of teaching but it has become 'as a requirement ... for a sine qua non of a modern learning/teaching culture', stressing the cultural elements of strategy similar in theme to those of the cultural school as discerned by Mintzberg (1994).

Lerner (1999) advises there are many differences between the business model and the university model and it is important that higher education institutes adopt the business model to their environment. Lerner (1999) alludes to some key differences such as:

- timeframe – longer in higher education
- consensus – required in higher education while strategy is mostly driven from top down in industry
- value system – bottom line in industry while a focus on delivering graduates to society remains the priority in higher education
- customers – more complex from a higher education perspective as many stakeholders may be viewed as customers
- context – change may be harder to deliver in higher education.

Lerner (1999) also points out, that designing a loosely coupled strategic process reflecting the reality of a higher education institute is imperative so that the interdependencies and differences of the loosely coupled units are acknowledged in the strategic process. This should work well where partnership is to the fore under a shared governance (Lerner 1999, Katz et al 2002 and others) model.

Collis (2001) looks to Porter's (1996) industrial analysis model when examining ICT strategies for higher education. Collis describes a closed shop scenario for elite universities where barriers to entry are high, because of investment required and the time it takes to build reputation or goodwill, a model which may fit well with universities such as Oxford. Collis (2001) along with Peterson (1998) and others, do however identify ICT as a key driver for change, which may allow easier entry to higher education and thus somehow level the playing pitch. It is from this perspective that the IOT sector may leverage the use of ICT. Katz et al (1999) writing on the effects of ICT on higher education strategy contends not only will ICT be a driver for

change, but it will force higher education institutes to adopt competitive ways of thinking. He adds that the primary drivers of change here include the following:

- Educational applications will be remunerative in the infotainment market
- The size and growth attributes of this market are likely to attract new and non-traditional competitors
- Innovative and entrepreneurial colleges and universities will enter into unusual alliances with non-traditional partners
- The failure to innovate and invest relatively early will foreclose competitive options for many colleges and universities
- Colleges and universities with the most intellectual capital will have a new and powerful source of competitive advantage.

Katz et al (1999) finds that those departments within a higher education institute who cater for adult learners and professional development have adopted business practices, more readily than heartland faculties, both in terms of revenue generation and the use of ICT to deliver to their students. In the IOT sector this theme is being actualised through the Adult and Continuing Education Departments. These if you like are the early adopters and are probably more market sensitive as Katz et al (1999) suggest than traditional academic departments. There is a probability here, that core academia may follow in time, their adoption of business practices. The IOT sector is probably more insulated from Katz et al (1999) rather radical ideas on the effects of the integration ICT into TL&A, mainly because of the funding model, reasonable demographics, lack of appetite or resource underpinning for entering the pure eLearning education market and little evidence of competition in the sector to-date. This does not preclude IOT's from looking to this domain for competitive strategies in the future.

Having set the strategic thinking scene and having summarised a number of studies on strategies in higher education (particularly those focusing on ICT), the disquisition now turns to the question: what are the important elements in the development of a good strategy for the integration of ICT into TL&A? Primarily, the literature (Ciborra 2004) informs us that such a strategy ought to lie within the overall TL&A strategy as depicted in figure 6 below. The TL&A strategy is in turn in optimal circumstances a subset of the higher education institutes overall strategic plan. This thinking reflects Willcoxson's (2002) and Curran's (2004) commentaries on multiple simultaneous

strategies and ICT strategies fitting within the overall HEI's strategy. Figure 6 is also representing in a higher education setting what Sauer & Yetton (1997, p 53) suggest:

*“... IT needs to become part of the business rather than being treated as something ‘out there’ that needs to be passively aligned with the business. Success will come to those who make IT managers an integral part of defining business opportunities and not simply builders of other managers’ solutions...”*

Ashour (1973), Fiedler (1983), Dant and Francis (1998), Peterson (1998), Ciborra (2004) and others discuss contingency theory where strategies are developed based on both internal and external contingencies of the moment. Hedman and Kalling (2002, p 2) in their paper exploring, the business model, highlight the difficulties in identifying how ICT strategy can be harnessed or measured to account for its contribution to improved organizational performance.

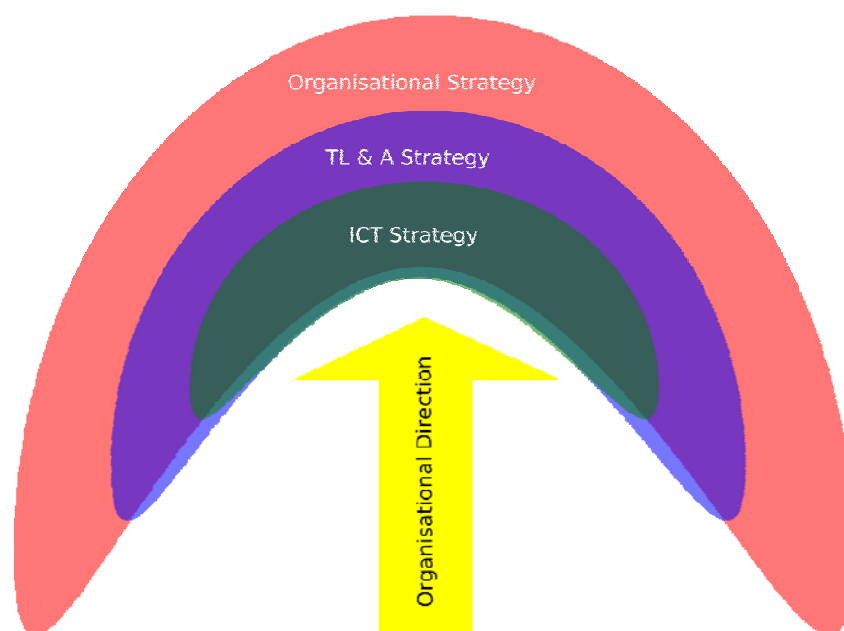


Figure 6. ICT Strategic Alignment in higher education

*‘...in order for ICT to contribute to performance, it must be acquired cleverly, it must fit with other resources, it must be understood and used by people, it must be aligned and embedded with the organization in a unique way. Any improvements in activities must be materialized by an offering that increases customer-perceived quality’.*

Here Hedman and Kalling (2002), commentate on the systemization of ICT and some sort of measurement of its effects on outcomes. This presents serious challenges as to how this measurement might be achieved in a higher education institute. This is

integral to what Solow (1987) described as the 'IT Productivity Paradox'. Solow (1987) here questions whether the large investments made by organizations into ICT have a positive effect on productivity. So in a higher education context can we say these investments produce better graduates or are graduates produced in a more cost effective manner?

At this point it is important to acknowledge briefly theories around ICT diffusions such as 'drift' (Ciborra et al 2001) and ICT strategic alignment (Ciborra et al 2001 and Verweire and Berghe 2004). Ciborra et al (2001) delineates how ICT diffusions with clear mandates from senior management tend to drift on implementation for myriad reasons such as environmental factors, poor fit with organizations established business practices and bottom up resistance. This drift, Ciborra et al (2001) suggests, demonstrates that technologies are active rather than passive in their implementations. Because of the temporal nature of implementations the idea of 'black boxing' or modularising technology may mitigate against positive outcomes arising from this drift. Ciborra et al (2001) contend that this drift needs to be understood and unravelled as there are valid reasons for its existence which can prove beneficial for organizational learning from ICT implementations.

Verweire and Berghe (2004) discuss ICT strategic alignment and the dissonance and tensions that may exist between how senior management and information systems (IS) staff view ICT strategy. They suggest a need for senior management to work closely with IS staff to ensure ICT strategy is aligned with overall business strategy as depicted in figure 6. In addition there may be a requirement to maintain a balance between a centralised and distributed appropriations of ICT within the organization. These ideas are supported empirically in Collis and Van der Wende (2002) study on ICT implementations. Ciborra et al (2001) maintain that strategic alignment is extremely complex, is fragile and dynamic and is dependent on the socio-technical order of the organization. Ciborra et al (2001) propose the need for constant minor adjustments in ICT strategic alignment to sustain the fragile and dynamic nature of this situated socio-technical order.

Hasebrook, Hermann and Rudolph (2003) identify trends in the integration of ICT into TL&A. They state that eLearning will not replace traditional classroom education, but will expand the market for educational products and services instead. This will help to bring more traditional non-learners into education. Curran (2004) in his work on strategies for eLearning found that most higher education institutes have used the

integration of ICT into TL&A to suit their strategic aims and as a result, he concludes that this process may not be as threatening to academics as previously imagined. The Danish Consultancy firm PLS Ramboll (2004) present interesting findings in their examination of eLearning strategies in their final report for the EU Commission entitled Studies in the Context of the ELearning Initiative: Virtual Models of European Universities. They came up with four categories of institutes which are described as

- the frontrunners where
  - 75% have a formal ICT strategy
  - Substantial use of online registration for courses
  - ICT is integrated in the teaching on campus to a very large extent
  - Substantial numbers of eLearning courses are incorporated in basic academic training and in supplementary training
  - Very positive attitudes towards ICT among both management, teachers and students
  - Substantial funding for ICT from the universities themselves
  - Huge involvement in strategic cooperation with domestic and foreign universities, as well as with other suppliers of education
- the co-operating universities where
  - 63% have a formal ICT strategy
  - Digital services such as online course registration are not as widespread
  - ICT is integrated in the teaching on campus to a very large extent
  - ELearning courses are offered to a minor degree in basic academic training and supplementary training
  - Positive attitudes towards ICT, especially among management and students. Some sceptical teachers.
  - Funding consists of a mixture of government funding and funding from the universities themselves
  - Huge involvement in strategic cooperation with domestic and foreign universities, as well as with other suppliers of education
- the self-sufficient universities where
  - 60% have a formal ICT strategy
  - Digital services such as online course registration are not as widespread



- ICT is integrated in the teaching on campus to a very large extent
  - A considerable number of eLearning courses are incorporated into basic academic training and supplementary training
  - Positive attitudes towards ICT, especially among management and students. Some sceptical teachers.
  - Substantial funding for ICT from the universities themselves
  - Very low extent of strategic cooperation with domestic and foreign universities or with other suppliers of education
- the sceptical universities where
    - 13% have a formal ICT strategy
    - Digital services such as online course registration are not as widespread
    - Limited ICT integration in the teaching on campus
    - Very limited numbers of eLearning courses are incorporated into basic academic training and supplementary training
    - Attitudes mixed towards ICT – a substantial number of teachers in particular are sceptical
    - Funding of ICT is a mix of government funding and funding from the universities themselves. EU funding is also relatively important
    - Low extent of strategic co-operation with domestic and foreign universities or with other suppliers of education

They surmised that most higher education institutes face a significant challenge in moving from project based ICT integration to systemic/strategic integration. They also found that the existence of ICT strategy is a significant driver in delivery of the ICT integration process. PLS Ramboll (2004) also suggested that ICT integration strategies should be developed on a national basis and that co-operation between successful and less successful implementers might be encouraged.

Is there any evidence of a strategy to harness bottom up initiatives in relation to the integration of ICT into TL&A here? For example you may have a scenario where one academic in his/her department has set up a web server in order to make his/her lecture notes available to his/her students online. Is there a methodology in situ to allow such a scenario evolve into a more systemic approach to the integration of ICT into TL&A for the department and subsequently the entire organization, through mechanisms supported by organizational learning maturity?

In 2005 an OECD report was produced, which sought to determine whether ICT or eLearning in tertiary education, was as a result of institutional strategy. The report found various responses to the question on the integration of ICT into TL&A and strategy. For example some respondents to their survey professed to be seriously committed to eLearning and/or the integration of ICT into TL&A, while displaying little or no attention to a discernable strategy. It was determined that other respondents had strategies which may or may not have been integrated with overall organizational strategies. Some organizations in the report display evidence of strategies tied to departmental units of the larger organization. However most of the institutes surveyed advised that they had some form of written eLearning ICT strategy. The report refers to the emergence of documentation in relation to strategies as codification which may or may not have been prompted by government or other external stakeholders. Cornford and Pollock (2003), who are referenced within this report, propose that the increasing use of ICT in both teaching and administration strategies is adding to codification in as much as it edges organizations in the direction of standardization. There is evidence of codification being deployed to this effect in the IOT sector in Ireland, particularly on the administration side and even, more recently, on the teaching side where standard systems such as SCT Banner for student administration have been imposed by Government and to a lesser extent LMS systems such as Moodle in TL&A, have become the norm across the sector. The OECD (2005) report as with other similar reports attests to a blended learning approach supported by the integration of ICT into TL&A in a campus based institute. The report also found that eLearning/ICT strategy was seen as one of the central themes core to the development of the institute.

### **2.3 Leadership Stakeholders**

Having established that strategy intent is important with respect to ICT in higher education, the study now turns to the role of internal stakeholders, focusing on the role of management and leadership. Bates (2000, p 42) reports the importance of leadership in creating a sustainable technological change process when he states

*‘..the widespread use of new technologies in an organization does constitute a major cultural change’.*

A level of skill or eCompetence in the employment of ICT in day-to-day activities may almost be taken as a given in a modern higher education institute, as clearly

described in extract from the University of Edinburgh's strategy statement referred to earlier. Change and transformation, which affect not only individuals but systems and processes, demand leadership of the highest quality and not simply heroics. To sustain technological change managers must understand how their organizations work and in particular how the leadership of the organization works to affect change. In a technological change environment, Baldrige et al. (2000) identify the 'strategic ambassador' approach to leadership, where the leader is central to a number of social concentric circles rather than at the apex of a hierarchical organizational pyramid. Baldrige et al. (2000) also portray this theme in American universities as in terms of a 'mayoral approach', where leaders demonstrate an ability to bring together varying factions to achieve an organizational goal. Charisma for a leader is also seen as important in this environment so that the leader can deliver effectively on buy-in for all relevant stakeholders to the change process. Championing of technology as a way forward for a department or organization is also viewed as an effective leadership strategy. Successful collaborative change is very much dependent on qualitative support from the leaders of an organization.

The leadership concept is a theme that as yet has not been embraced in the institutes of technology in relation to ICT integration into TL&A. The OECD (2004) report advises that leadership in Irish higher education institutes be distributed and not concentrated as a single post. The examination of best practice and the questioning of paradigms in this would require an organization to have embraced Senge (1990), Pedler et al (1997), Marquardt (2002) and others ideas of the learning organization. The type of leadership concept applicable to the learning organization is that of distributed leadership as described by in Golden (2006). Here key staff are empowered to take leadership roles at all levels of the organization, within a coherent strategic framework. Drucker (1993) supports this idea when he discusses leadership around cultural change. He further contends that because information based organizations consist of knowledge specialists, they cannot be an organization of boss and subordinate, in tight hierarchical configurations. Other studies, such as that by Schneckenberg and Wildt (2006), have found that leadership at the highest level in the higher education institute may have little or no influence on successful deployment. This was also noted by Collis and Van der Wende (2002), who maintained that key leadership in deployment was shown to be evident at departmental level. In a study presented by Crawford et al. (2003) on varying types of organizations in the relationship between different types of leadership and innovation,

transformational type leadership scored best over transactional and laissez-faire type leadership approaches.

The level of integration of ICT into the core business of higher education institutes such as for example TL&A also prompts questions into where ICT management staff fit within the organization. For example if ICT is not represented at senior management level, in say a Chief Information Officer (CIO) type role as in industry, can the strategic need for the level of integration required be championed and supported in an IOT, something Sauer & Yetton (1997) suggest is desirable in a modern organization. The absence or scarcity of teaching and learning units, allied to no Chief Information Officer (CIO) posts at senior management level, in the IOT sector is evidence of the lack of clarity around the leadership role in ICT integration into TL&A.

Collis & Van der Wende (2002) and Kop et al. (2004) in their research on policy and strategy on ICT in higher education allude to the dissonance between the level at which strategies are decided and the level at which they are implemented. Their findings point to strategy being decided at central senior management level while requiring implementation at departmental level. They also noted that little input was sought from academics at the chalk face in the consultation process during the development of the strategic plans. The findings of this study may reveal evidence of similar dichotomies in the IOT sector in Ireland. Collis & Van der Wende (2002) also point out that there is little evidence of strategy development linking a focus on different types of students to their required ICT support structures.

## **2.4 The Student Stakeholder**

*Active students do not progress at the same pace, necessitating an approach to education which makes it possible for learners to steer their path of intellectual growth in such a way that they stay within the borders of their own disposition between boredom and anxiety (Steyn, 1999 p. 179 - 185 ).*

The scope of this study will not include a detailed investigation into the integration of ICT in TL&A from the student stakeholder perspective. However, it is acknowledged that, a major force field driving the integration of ICT into TL&A is of course the changed student and the evolution of student expectations, allied to the requirement

of improved service in preparation, delivery and assessment of course material, in the 21<sup>st</sup> century higher education institute. Meeting student expectations (Nicol et al 2004) is becoming increasingly more complex. The changed student is more discerning, has less time to attend formal lectures due to work and other life style commitments, and increasingly requires education delivered to him/her wherever and at whatever time he/she wants it. Here we can see a trend towards convergence between the traditional campus based undergraduate and the distance learner. Some literature advises that the move towards the student-customer (Patterson 1999) orientation, where the demands now are for student-centred learning (Mac Labhrainn et al, 2006), modularization, constructivism and flexible modes of delivery, are being applied to sate the needs of the changed student.

There is a belief that ICT can provide a one size fits one to meet these student learning centred demands. The University of Catalunya (in Sangrgrave 2002) claims to have the student at the centre of what it calls a 'personalized educational process'. Today's undergraduate is part of what is colloquially known as the 'net' generation and as such have previous experience of service delivery via ICT and the internet. Consequently he/she may be disappointed if the same service cannot be provided in his/her higher education learning environment. Measuring success in the integration of ICT into TL&A should employ indicators aligned with the student stakeholder, if they are to be rigorous. Baldrige (2006) emphasizes the importance of the student stakeholder in his examination of performance excellence. OECD (2005) alludes to stakeholder scepticism in relation to the increased benefits to learning outcomes from the integration of ICT into TL&A.

The introduction of customer relationship management systems (CRM) (Katz et al 2002), into higher education is indicative of an emerging view, in some cases, of students more as customers (Patterson 1999) rather than raw material which may have been the case in the past. One such product comes from ORACLE called simply Peoplesoft Enterprise CRM for higher education. This trend is summarized by Anderson & Grant in Katz et al, (2002, p 32) below.

*The concept of students, alumni, faculty members, and staff members as "customers" will become a competitive imperative with profound impact on how colleges and universities attract, retain, and serve customers of all types.*

The literature does point to the fact that the integration of ICT into TL&A will not replace traditional methods of teaching but will form part of a blended environment. From Murphy et al (2003), in their study of advanced Open Universities in Asian countries, it was found that students were not entirely comfortable with eLearning on its own but required more traditional methods in addition to support their learning experience. Murphy et al (2003) conclude that this 'flesh & pixels' (The Economist 2003) approach, is in keeping with trends worldwide. Australia has many examples of evidence on strategies for the integrations of ICT into TL&A. Some of these are documented in Boezeroy et al's SURF / LTSN 2002 book titled 'Keeping up with our Neighbours: ICT developments in Australian higher education'. One example from this book is that from the Centre for Educational Development and Interactive Resources (CEDIR), which is lecturer driven and includes technical support and research on the integration of ICT into TL&A. Another example of strategic implementation from this book is the Charles Sturt University approach and its 'Centre for Enhancing and Learning Teaching' (CELT). CELT provides semester long training for new staff in the use of ICT in TL&A in addition to providing other supports such as an educational designer to academic staff.

Boezeroy (2003) found in her examination of Australian universities, the key driver for the integration of ICT into TL&A is the provision of flexible modes of delivery to the learner. This is because the learner himself/herself is changing. Flexible modes of delivery are one of the key change processes presently being championed in the IOT sector in Ireland. This is reinforced by the different profile of learner now emerging to source further education. Bell et al. (2002) describe some of these as for example 'learner-earners', i.e. full-time students working while they study, and 'earner-learners', i.e. full-time workers returning to study. In Ireland many in academia now accept that we now have part-time students attending full-time courses. Increasing numbers of these types of learners are demanding more flexible modes of delivery. Part of the response to this demand is the further integration ICT into TL&A. From the strategic perspective Boezeroy (2003) found that in Australia several universities appointed an assistant dean in each faculty to champion the fusion of ICT into TL&A. This strategic input is also reflected in the way budget allocation has changed from being independent faculty based to centrally administered and tied to strategic plans. The overall strategic view also included support for staff development and special recognition for staff willing to be involved in leading edge ICT and TL&A integration projects.

## **2.5 Environmental Factors**

Many factors are necessitating the need for strategic approaches in higher education. Boezerooy (2006), Deem (2001), Bates (2000), Senge, (1990), among many others write about environmental factors and their influence on strategic approaches (some with an explicit focus on the integration of ICT into TL&A). The IOT sector in Ireland in recent years is experiencing the demands of a changing environment and the increase in influence of external stakeholders in individual institute's business processes. IOTs are coming from a place where they fitted neatly into a two-tier higher education structure. Then, their student cohort came mainly from their regions and there was little or no competition because of demographics and cohort profile between them and other IOTs or with the second tier university sector. IOTs up to now have had little if any financial autonomy. Today they compete in a global marketplace for foreign students. Financial autonomy is looming with the move from direct funding by the Department of education and Science to the same funding body as the Irish universities via the Higher Education Authority (HEA). As part of this funding transformation there is a move towards establishing unit costing as a comparable metric across the Irish higher education sector.

There is also blurring of the traditional two-tier HE sector in Ireland boundaries in recent years. All IOTs now compete for students and research funding both against and in collaboration with the universities, while others have aspirations to become universities, now that some have achieved self awarding up to level 10 (PhD) of the National Qualifications Authority of Ireland (NQAI). The influence of external stakeholders such as the government has increased significantly in demanding coherent strategic plans tied to pay agreements for staff and the service needs of the economy. These demands are further influenced by EU directives, OECD reports and other supranational developments. An example of one such demand arises from the Sorbonne declaration of 25th of May 1998, which was underpinned by considerations that stressed the university's central role in developing European cultural dimensions. It emphasized the creation of the European area of higher education as a key way to promote citizen mobility and employability and the overall development of the EU. As part of this the adoption of a system of easily readable and comparable degrees the implementation of the Diploma Supplement was sought. In recent times the IOTs in Ireland have been considering issuing this Diploma Supplement with their awards.

In addition to the uptake of the NQAI awarding standards, there are also efforts being made to normalize and modularize courses for the European Credit Transfer and Accumulation System (ECTS). Allied to this is the idea that external stakeholders, such as government and the Higher Education Authority (HEA) are demanding the increased integration of ICT into TL&A for the more efficient management and delivery of service by IOTs. A recent example of this is where academics in the IOTs must enter exam results onto a centrally hosted SCT Banner student administration system as part of securing their next pay increase.

Another factor which is influencing strategies concerning the integration of ICT into TL&A is the promotion of the Life Long Learning (LLL) agenda by both national governments and the EU. The integration of ICT into TL&A is often acclaimed as a means to social inclusion for life long learning, and this requirement ought to be reflected in emerging strategies. The term e-inclusion has been coined to describe the social inclusion opportunities afforded by the integration of ICT into LLL. Studies have been developed both at national and EU level in this area such as for example the 2003 report 'E-inclusion: Expanding the Information Society in Ireland' or the work emerging as part of the 6<sup>TH</sup> Framework Programme via the IST (Information Society Technologies) Priority in its e-inclusion strategic objective. Much work has also been done by the IST program in their K2 project which researches technology enhanced learning. One interesting thread of the K2 project is the idea of higher education institutes employing CRM (Customer Relationship Management) or eCRM technologies. This thread is based on the premise that higher education institutes are commonly adapting business systems (Deem 2001, Meek 2003) for example the SAP systems appropriation in Cornford & Pollock (2003) or indeed the Core finance systems in the IOTs in order to adapt and survive in the global knowledge based economy of the 21<sup>st</sup> century. These initiatives present an opportunity for the IOTs, where flexible modes of delivery are being developed to meet targets in the LLL arena for both national and EU stakeholders:

*"...But this potential of technology, to enrich and to enhance the teaching and learning process, and to support flexible learning modes, has not yet been fully recognised nor systematically exploited in European Universities.." Schneckenberg, D. & Wildt, J. (2006, p. 203)*

Emergent policies from stakeholders at global, European and national level can strongly influence strategies on the integration of ICT into TL&A in IOT sector. This influence includes a number of drivers:



- much funding for the sector has emanated from the EU in the past
- their small size makes them vulnerable to external pressure
- their traditional lack of autonomy in steering their own course leaves them open to direction from outside

The drivers for the integration of ICT into TL&A are sometimes contradictory and may depend from which source they arise, i.e. top down or bottom up. Bates (1997) describes four reasons for integrating ICT into TL&A:

- to improve access to education and training
- to improve the quality of learning
- to reduce costs of education
- to improve the cost-effectiveness of education

The development of a program such as 'Pedagogy for Online Learning' by the Global Virtual University (GVU) is indicative of efforts to address training needs by the development of higher education programs, on the theme of the integration of ICT into TL&A. The drive towards the information society or the knowledge economy, which is a high priority for both the Irish government's and a substantial part of the EU's agenda, is an important environmental factor for the IOT sector, driving the further integration of ICT into TL&A.

Zhang & Nunamaker (2003) advise that phenomena such as globalisation and increased competition are also driving the need to integrate ICT into TL&A, in order to satisfy the appetite of the modern learner. Coaldrake and Stedman (1999) describe some of the elements of the changing higher education landscape and the influences on increasing demands for the integration of ICT into TL&A within higher education institutes. They include:

- Increasing and widening of participation in higher education – in the IOT sector the government have set targets for adult learners participation rates
- Shifting financial models for changes in higher education institutes, demanding more accountability and cost reduction – in the IOT sector this is reflected in the move towards new financial models such as unit costing
- Increasing knowledge availability requiring more cohesive integration and presentation methods – in the IOT sector the ubiquitous availability of ICT

- Industrialization of higher education and the demand for closer links with the business community – in the IOT sector the development of Innovation Centres on most campuses and their alliances with various academic departments in the promotion of applied research for local industry is evident
- The emergence of information technology itself and the opportunities it presents for the transformation of TL&A – evidence in IOT sector of the increasing use of learning management systems.

As discussed in Scott (2000), in order for ICT to be effective in TL&A, higher education institutes needs to adopt more flexible organizational structures. O'Hearn (2000) also asserts that contemporary university structures must be changeable and adaptable, and be capable of engaging with new learning and communications technology. One aspect of this more flexible organization emerging is the increased links and cooperation between higher education institutes and other external organizations (Patterson 1999). The inexperience of higher education institutes in relation to organizational change around the integration of ICT into TL&A may be creating the need for these external alliances as Teare (2000) states. Jones (2000) also advises that there is a requirement to acquire expertise in the integration of ICT into TL&A.

The emergence of ICT strategy in higher education institutes may also emanate from national initiatives. The SURF (2003) initiative in the Netherlands, where standardization of student ids, via *The Virtual Clearinghouse Higher Education* (VCH), could be viewed as an example of one such strategy. There are similar developments in play in Ireland. For example the recent establishment of an organization called An Cheim in the IOT sector whose remit is to standardize and outsource all management information systems for the 13 institutes of technology and Dublin IOT confirms this trend. At the same time, legislation has been enacted which moves funding for the IOT sector from the Department of Education and Science (DOES) to the Higher Education Authority (HEA). These significant macro changes are and will influence policy development in relation the ICT into TL&A in the IOT sector into the future.

## **2.6 Models of ICT Integration Strategies**

So far, we have discussed strategic thinking and addressed studies on strategy and ICT, and looked at various stakeholder perspectives. Now the disquisition moves on

to relate which models, if any, have been proposed or have emerged from the literature. Bigum (1997), Curran (2004), and Bonk & Graham (2004) among others all refer to this phenomenon of the prevalence of ICT in society as the emergence of ubiquitous computing (Hawkins et al, 2002, Smith 2003, SURF 2004, Weckmann & Engert 2005).

Before we discuss any models that may emerge from the literature in relation to the diffusion of ICT it is important to acknowledge the idea of the 'duality of technology' (Orlikowski 1992) and the recent trend of meshing ICT and organizational change research (Barrett et al 2006) to try and gain a better understanding of the reciprocal nature of these themes. From this the study will underpin its understanding that the idea of a 'black box' (Callon & Latour 1981) view of ICTs cannot be supported. This discussion is important in that the writer acknowledges that the empirical section of this study cannot address entirely the holistic themes inherent in the 'duality of technology' because of this study's cross-sectional methodology. By duality here the writer takes Orlikowski (1992) to mean that ICT appropriations are moulded over time both by the actions of *reflexive* members of an organization and by the social context of the organization itself in an interdependent and iterative fashion. The 'duality of technology' has complementarities with Argyris and Schöns' (1978, 1996) discussions on mode I and mode II theories in-use which are explored in the next chapter. Ciborra's (2004) seminal work on aspects of how complex ICT systems are developed in organizations shows parallels here where he posits the idea that the uniqueness of organizational context opposes the determinism of ICT deployment strategies. Ciborra (2004) refers to the hospitality of the organization towards a new technology. When the values of the organization are compromised by new technology, this may lead to the new technology being treated as the enemy, leading to a withdrawal of hospitality and thus failed deployments.

Barret et al (2006) conclude that the increasing convergence between business and ICT consultants is evidence of the actualisation of the 'duality of technology'. The move towards the exploration of ideas in the literature such as the 'the 'duality of technology' (Orlikowski 1992) is contemporaneous with what Rosenberg (1990) describes as social science researchers investigating the processes of ICT innovations. Thus the idea of the 'duality of technology' (Orlikowski 1992) and the ongoing research in this field requires a move away from viewing ICTs from a 'black box' perspective. Callon & Latour (1981 p.285) state *a black box contains that which no longer needs to be considered, those things whose contents have become a*

*matter of indifference*. So this study in a sense by tackling the diffusion of ICT from both an organizational learning framework and by establishing a measure of ICT use based on individual response is in keeping with the idea of the ‘duality of technology’ (Orlikowski 1992) and also opposes the view of ICT as a ‘black box’ (Callon & Latour 1981).

Now turning to models, it will not be a surprise that the literature does not supply a universal model. Stoner (1996, p 12) advises that

*‘Unfortunately there is no single right way, because the complexity of change management is such that it is unrealistic to seek “universal solutions.”’*

This complexity is emphasized in literature dedicated to the theme of social learning and technology innovation. Here for example Williams et al (2005) describe how earlier innovation projects were designer led. These resulted in an outcry when projects failed and as a result designers were blamed for not inviting user buy in. The pendulum then swung to user led innovation projects. However Williams et al (2005) suggest that the design process is ongoing in iterative cycles based on the social learning of all the stakeholders involved. Here they suggest the social learning from the interactions between for example designers and users should transcend the end user organization and effect learning in the designer’s organization also. These iterations and the social learning gained therein are not incongruous with Argyris and Schöns’ (1978, 1996) learning loops. Lundvall (2004) advises on the lack of theories and empirical research in analyzing the learning process, once again emphasizing the complexities here. The writer although acknowledging the importance of the social learning debate in technology innovation feels the scope of this cross-sectional study across the IOT sector will not allow for empirical analysis of this theme, which may be more suited to an ethnographic study.

Many higher education institutes (OECD 2005) have now developed policies and strategies around ICT integration in more recent times. This trend is indicative of the increasing acceptance of the integration of ICT into TL&A and the role it plays with regards to managing change within higher education institutes. Terms like the technology adoption lifecycle, eCompetence and diffusion of innovation have emerged through the literature from writers such as Moore (1991), Stalmeier (2006), Uys & Campbell (2005) and Rogers (1995), among many others, in order to describe or somehow measure innovation and diffusion or more specifically, the level of ICT

penetration into TL&A and whether strategic influence may have an impact here. Their discussions reveal a continuum of deployment from one where individual academics take it upon themselves to introduce ICT into their TL&A processes, through a bottom-up approach to one where a systematic institutionalized approach is in evidence i.e. a top-down approach. Switzer (1992) echoes this when he states that the successful implementation of an ICT into TL&A, is in itself a significant change management program. Such an approach requires that institutional commitment from a systems perspective be forthcoming. Uys (2003) captures this idea as he declares that an appreciation of the systemic nature of the infusion of instructional technologies for open learning, constitutes a critical success factor for the successful integration of ICT into TL&A.

As can be appreciated a study in an area of rapid change over a short space of time presents particular difficulties. Consequently it is imperative to identify a suitable theoretical framework with which to explore some of the core concepts of the study. The study seeks, as part of the discussion, the development of or arrival at a tool for the subsequent analysis of the level of integration of ICT into TL&A. In this exploration, elements of the 'Diffusion of Innovations' (Rogers 1995) framework were examined.

Rogers (1995) model, depicted in figure 7, defines diffusion as the process by which an innovation is communicated through certain channels over time among the members of a social system. This theoretical framework has been used in many studies in the past successfully. Although requiring further investigation it seems likely that this framework or parts thereof, with some adaptation, will prove worthwhile in assisting in the understanding the evaluation of the level of integration of ICT into TL&A. The study will explore the adoption process of Rogers's framework where he identifies the stages of awareness, interest, evaluation, trial and adoption.

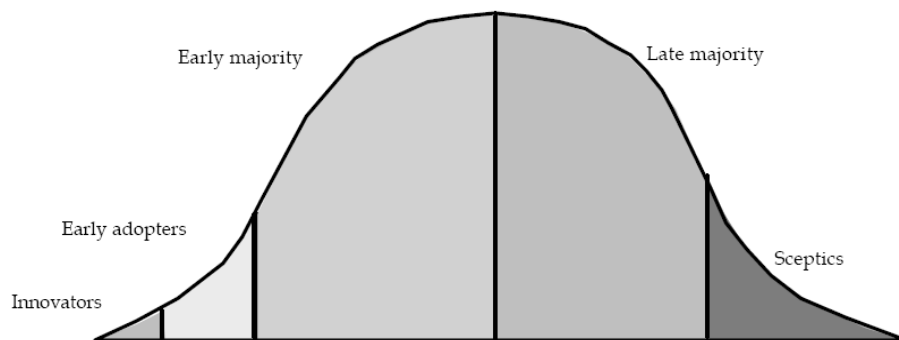


Figure 7. DOI Theory

In this the three main types of innovation decision are optional innovation, whereby an individual decides to adopt an innovation him/herself, collective innovation whereby an individual decides to adopt an innovation collaboratively with a group of his/her peers and authority innovation whereby adoption of innovation is imposed from on high. When the implementation of an innovation such as integrating ICT into TL&A is organization wide, and Roger's authority innovation is employed, the adoption can prove difficult where a gap exists between the decision makers and the implementers. Collis & Van der Wende's (2002) study demonstrated this empirically. Rogers (1995) advises on the importance of a change agent in any effort involving the adoption of an innovation. When an innovation has been adopted and becomes part of everyday operation by an individual, it is critical that positive re-enforcement is provided by the change agent in order to avoid discontinuance. Geoghegan (1995) characterizes early adopters of information technology in their teaching as:

- favouring revolutionary change;
- visionary;
- strong in their technology focus;
- risk-takers;
- experimenters;
- largely self-sufficient;
- horizontally networked i.e. used to working across disciplinary boundaries and across groups

In contrast, the mainstream majority who are slower in adopting new innovations are characterised as:

- favouring evolutionary change;
- pragmatic or conservative;
- strong in their problem and process focus;
- risk-averse;
- wanting proven applications of compelling value;
- needing support;
- vertically networked i.e. used to working within the boundaries of their discipline;

Geoghegan (1995) argues that, while recognizing the importance of the early adopters and needing to capitalize on their expertise and enthusiasm, we must not

use them as a benchmark, of what is possible or desirable for all staff. Quite different strategies and approaches are needed to bring the mainstream majority on board. Taylor (1998) approaches the issue more from the point of view of numbers and makes the point that early adopters or lone rangers do not make up the critical mass needed for institutional change. Although academic change management innovators find these early adopters very easy to work with, change management strategies need to extend beyond them. Taylor (1998) suggests appropriation as a possible strategy i.e. taking the work of the early adopters and implementing already developed practices and approaches on a wider scale. He then suggests that once staff are comfortable with the approach and have evaluated it in their own context, they may then adapt or re-develop the approach themselves. When this approach is embraced by a critical mass, it is then up to institutional managers and leaders to mainstream and sustain its systemisation. Developing in this way, seems a little one sided as it seems to abrogate the responsibility of management to lead the change. Taylor (1998), Doyle (2002) and others certainly acknowledge the need for some interaction between individually focused and institutional strategies to facilitate change on a large scale. However, Taylor (1998) does not give many clues as to how this process of appropriation might be facilitated and encouraged. Furthermore, the 'not invented here' syndrome needs to be overcome for this process to work.

*"In general, innovations that are perceived by receivers as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations" (Rogers, 1995, p.16).*

Rogers (1995) alludes to the establishment of peer networks which enhance and assist in the efficacy of diffusion. Peer networks might be compared to Wenger et al's (2002) communities of practice, associated with the learning organization, where they advise that learning requires the promotion of an open atmosphere and a sense of collective enquiry, which one would think should fit well within an academic collegial environment. Peer review is advocated in the literature here for example in Kirkwood and Price (2006). However, the allocation of time for such reviews, in reality may not be sufficient. Luppicini (2002), in his exposition on systems modeling research into distance learning, also advocates the promotion of learning communities.

Fichman and Kemerer (1999), Gilbert & Kelly (2005) and others reflect on a gap between the acquisition of a technology and its integration. This gap is known as the assimilation gap, which is of particular significance (Gilbert & Kelly 2005) in the higher education sector. Lecturers in higher education have a high level of autonomy

(Bates 2000) and thus it can be difficult to encourage them into adopting new delivery methods. This study may identify evidence of the assimilation gap. Davis et al (1989) technology acceptance model (TAM) is another model, similar to Roger's (1995) diffusion of innovation theory, which is used to test innovation deployments. This model concentrates on perceived usefulness and ease of use much like the diffusion of innovation's relative advantage and complexity. TAM is an adaptation of the theory of reasoned action developed by Ajzen & Fishbein (1980) to describe and predict the behaviours of people in a specific situation. The main variables in the TAM model are perceived ease of use (PEOU) and perceived usefulness (PU). The TAM model has proven to be a worthwhile theoretical framework in understanding behaviour around the integration of ICT, and has been widely employed in empirical research. In order to ascertain measurement of integration some of the variables defined in Collis & Van der Wende (2002) study may also be considered.

Both the diffusion of innovation and the technology acceptance (TAM) models are worthwhile well established models which have been employed in a large body of research work to-date. However Fichman and Kemerer (1999) suggest that the diffusion model is best applied in observing innovations among subjects over time. The TAM model as Legris et al (2003) suggest may produce inconsistent results while there is also a temporal element integral to this model. The scope of the current study allows for a view of the subjects in a single point in time. This will lead to further exploration of models in Chapter III which will hopefully provide a model which displays better fit for the purposes of this study. Notwithstanding this, a summary analysis on data around innovation decisions will be presented in Chapter V, based on the diffusion theory.

## **2.7 Summary**

In the examination of strategic thinking, the discussion established that many attempts have been made to deploy strategic models (Lerner 1999, Meek 2003), originating in the business world, into the higher education domain. In the main these deployments were unsuccessful, given the difficulties these approaches presented for the higher education context. A continuum from basic strategic analysis tools through to complex topics such as systems thinking and organizational learning emerged. Buy-in was identified as essential to success in ICT integration strategies. Evidence was established revealing dissonance between strategic intent and what actually happens on the ground from the samples of empirical data that were found.



The sudden emergence of ubiquity of computing (Hawkins et al, 2002, Smith 2003, SURF 2004, Weckmann & Engert 2005) within higher education, happening in the absence of discernable strategies also impacted here. So, to some extent the strategic thinking in this area is playing catch up, with the codification of strategies being the norm at the minute. Consequently the systematic integration of strategies is far from maturation at present.

The evolution of IOTs from HEIs, which were once strictly not-for-profit and tightly controlled by government, to organizations now beginning to embrace the idea of the 'the entrepreneurial university' (Clark 1998, Duderstadt 2000 and Etzkowitz 2008) being driven by the emergence of phenomena such as managerialism (Deem 2001) and the 'audit culture' (Shore 2008), was described. The discussion in its treatment of strategic thinking in relation to ICT diffusion looked to Ashour (1973), Fiedler (1983), Dant and Francis (1998), Peterson (1998), Ciborra (2004) and others in the literature to briefly explore ideas around contingency theory where strategies are developed based on both internal and external contingencies of the moment. At this point the writer felt it important to acknowledge theories around ICT diffusions such as 'drift' (Ciborra et al 2001) and ICT strategic alignment (Ciborra et al 2001 and Verweire and Berghe 2004). The importance of recognising 'drift' in ICT appropriations was acknowledged and the opportunity for organizational learning which may be gleaned from this process ought not to be underestimated. Similarly care must be taken by management and staff in interpreting how strategic alignment in ICT diffusions is achieved.

This chapter next addressed leadership and in particular it's role in sustaining innovation was examined. The literature commented, for example Collis and Van der Wende (2002) and Baldrige (2006), that it was important that leaders be appointed at various levels within the higher education institutes in order to support sustained effort. Here examples from both theory and empirical case studies underpinned this theme. The role of the Chief Information Officer which is common in the business world but absent in the IOT sector was used to demonstrate the lack of clarity from an ICT leadership perspective here. The role the student stakeholder plays in driving the need for suitable ICT integration strategies was also explored.

Higher education institutes must be outward focused (Pirani & Salaway 2004) in order to maintain the correct strategic direction. This is particular pertinent in the IOT sector in Ireland, where almost all funding is dependent on external stakeholders

both national and international. Here key drivers are the question of access and the life long learning agenda which is being driven by the Irish government and indirectly by their paymasters in the EU. Allied to this pressure from outside on strategic focus is the effort to normalise higher education across Europe using the ECTS scheme. Ireland and its higher education institutes and particularly IOTs are extremely mindful of these contexts and drivers.

In the literature overall it is quite difficult to find a model that can capture the measuring of effective strategic planning initiatives in relation to the integration of ICT into TL&A. This study will examine whether educational technology leadership in the sector is embracing the change management required from systemization of the integration of ICT into TL&A, from the perspective of the principles of the learning organization, outlined early and returned to later in the thesis.

Prior to examining particular models around the diffusion of ICT the discussion focused on the idea of the 'duality of technology' (Orlikowski 1992). Orlikowski (1992) 'duality of technology' was found to be similar to Ciborra's (2004) discussion of the dynamism of ICT appropriations in that they change over time because of contextual factors arising in their host organizations. This literature stresses that one ought not to view ICTs as black boxes in these appropriations. Instead there is a need to unravel and study them in order to harvest the useful organizational learning opportunities these appropriations may present.

What models or strategies can we say are being adopted here? The diffusion of innovation has long been used in the literature to categorise and measure how organizations engage with technology. It can be seen that this categorisation may be applied to both individuals and organizations. Similar to the evolution in strategic thinking broached earlier the evolution of the diffusion of innovation can be traced through to more holistic approaches such as the technology acceptance model (TAM) and on to systems thinking and learning organization maturity. However as argued in the previous section both the diffusion of innovation and technology acceptance (TAM) models, although worthwhile exploring and not incongruous with the scope of this study, were not pertinently matched either due to their longitudinal focus. This disquisition thus acts as a preamble to further exploration of models to source a best fit for the study. These explorations will be pursued in Chapter III.

## Chapter III The Learning Organization

### 3.1 Introduction

*“....higher education sees itself as an enterprise so unabashedly complex, that it can't be sorted, classified or pigeonholed”* Gumpert 1997 p 23)

As indicated in Chapter II, this chapter will explore themes such as systems thinking and learning organization maturity from the literature, in order to ascertain their suitability as a strategic framework for the institutes of technology in Ireland in line with the research question posed by the study. This chapter will discuss how these themes fit with strategic thinking in the context of higher education institutes. An understanding of these topics is important to allow the writer to prepare for the development of and/or identification of a tool(s) around the research question, which will lead to the further actualization of the thesis and assist in the development of an appropriate research methodology. The previous chapter looked at leadership and the influence of external stakeholder as drivers in strategy formulation. This chapter continues the examination of other stakeholders, in particular academics, to a backdrop of the learning organization maturity theme.

### 3.2 Systems Thinking

In the evolution of the development of strategic planning, systems thinking (Senge 1990) has emerged as a main theme in recent times. This type of thinking is identified where the primacy of the whole is acknowledged in alignment with the needs of the individual. Figure 8 demonstrates how Mintzberg's (1994) schools of thought on strategic planning are combined into a systems thinking approach. The Baldrige National Quality Programme, from the United States, contends that a systems perspective means managing the organization, in a holistic manner, in addition to managing individual components, to achieve success in reaching strategic objectives. Baldrige (2006) uses business excellence criteria and translates them to equivalences within education. Baldrige (2006) sees the benefit in this model in that one can derive cross sector best practice and benchmarking through its use. There is an appetite for this type of comparative analysis in many modern western capitalist organizations. For example in Ireland we have recent public sector pay agreements

based on benchmarking against private sector pay levels. In addition, the rise of managerialism (Deem 2001) which was alluded to earlier in this study is important here. In the IOT sector there is currently a move towards unit costing, to underpin financial planning for the sector, in order to facilitate comparative benchmarking across the higher education sector in Ireland.

Figure 8. National Quality Programme (Baldrige 2006)

Baldrige describe this model in the following way Leadership (Category 1), Strategic Planning (Category 2), and Student, Stakeholder, and Market Focus (Category 3) represent the leadership triad. These categories are placed together to emphasize the importance of a leadership focus on strategy and on students and other stakeholders. Senior leaders should set direction and seek future opportunities for their organizations. Faculty and Staff Focus (Category 5), Process Management (Category 6), and Results (Category 7) represent the throughput triad. The organization's faculty and staff and key processes accomplish the work of the organization that yields the overall performance results. All actions point towards results — a composite of student, stakeholder, market, budgetary, financial, and operational performance results, including faculty and staff, governance, and social responsibility results. The horizontal arrow in the centre of the model links the leadership triad to the results triad, a linkage critical to organizational success. Furthermore, the arrow indicates the central relationship between Leadership (Category 1) and Results (Category 7). The two-headed arrows indicate the

importance of feedback loops or learning loops (Argyris and Schön 1978, 1996) in an effective performance management system.

Measurement, Analysis, and Knowledge Management (Category 4) are critical to the effective management of an organization and to a fact-based, knowledge-driven system for improving performance. Measurement, analysis, and knowledge management serve as a foundation for the performance management system. Elements of the Baldrige systems perspective are certainly pertinent to an examination of strategic intent around the integration of ICT into TL&A in the Irish IOT sector. As a key aspect of this study, the delineation of a link between leadership and strategic planning in the integration of ICT into TL&A and its effects on the deployment outcomes (results) is important. Category 4 of the above model comprises the identification of learning outcomes from the strategic planning process and their re-use. This theme is commensurate with Argyris and Schön (1978, 1996) learning loops, which are explored later in this chapter.

In strategic planning for ICT it is worth noting the approaches of Senge (1990), Mintzberg (1994), Liedtka (1998) and others. Their writings focus in on the systems perspective and in particular the ability of an individual or unit, because of enlightened strategic thinking, to be able to understand their role and recognize the influence their behaviours bring to bear on other parts of the system and on the ultimate goal of the organization. Thus in an analysis of strategic focus on the integration ICT into TL&A in HEIs, it is important to explore where individuals or groups are in tune with their part in the overall strategic plan of the organization. Thus ICT strategic planning for TL&A must be viewed from its synergies both vertically to the overall organizational strategic plan and horizontally to the strategic plans of other departments and functional areas.

### **3.3 The Learning Organization**

In the main the IOT sector is embracing technology for TL&A in a changing environment. This environment was outlined earlier in this study. So what does the literature tell us about strategic planning in a changing environment? Boyle (2004) highlights the tendency of academics and academic management to depend on opinion based practice. In this the actor is basing the development of effective strategies in a changing environment, on his/her beliefs, whereas such developments ought to be founded on evidence-based or best practice. Thus beliefs ought to be

actively examined, to determine their effectiveness by measurement and empirical research, in order to mitigate against ineffectiveness in this process. This type of strategic development process is linked to the work of Argyris and Schön (1978, 1996) on organizational learning culminating in the deuterio-learning models in figure 9 below. Argyris and Schön (1978, 1996) argue that when an organization engages in “deuterio-learning” its employees reflect on and inquire into previous episodes of organizational learning or failure to learn, as part of the strategic development lifecycle. The “deuterio-learning” model is a further evolution of previous work by Argyris and Schön (1978) on single loop and double loop organizational learning theory. In essence single loop learning is where one decides on an alternative plan to solve a problem where the current plan has failed, while double loop learning involves questioning critically the underlying variables that governed the original plan. Stacey (1992) describes single loop learning as transactional learning, while double loop and deuterio learning are transformational learning, while Fiol and Lyles (1985) describe lower-level and higher-level learning here. In deuterio learning mode employees of an organization ask more and more fundamental questions about their organization, by reflecting on and inquiring into previous episodes of learning.

Figure 9. Deuterio-learning. Nielsen 1996, 36. Quoted in Seo 2003.

Argyris and Schön (1978, 1996) conclude that this model of organizational learning refers to the organizational capacity to set and solve problems and to design and redesign policies, structures and techniques in the face of constantly changing assumptions about self and the environment. Argyris and Schön (1978, 1996) argue that most members of an organization appear to operate within their organizational context based on behaviour such as:

- Strive to remain in control as much as possible

- Minimise losing and maximise winning
- Minimise the expression of negative feelings
- Be reasonable.

The adoption of this behaviour can lead to strategies which can have a negative impact on the individual, the group and as a consequence the organization. These strategies can be manifest in for example:

- promoting your own agenda without debate or insight into other consequences and thus remain in unilateral control and hopefully win
- adopting the approach of not upsetting the applecart and so avoiding change to the status quo

Marquardt (2002) identifies six obstacles, which are deeply entrenched in modernist managerial and organizational psychology, that have to be overcome for an organization to become a learning organization. They are:

- bureaucracy which is a manifestation of control that stifles learning and innovation
- competition which emphasises selfish individualism leading to impoverished relationships
- control which results in low-discretion and low-trust cultures that prevent learning
- impoverished relationships which result in poor communications, defensiveness and mistrust
- poor leadership which neither preaches nor practices learning and promotes skilled incompetence out of fear of loss of control
- rigid hierarchies which maintain silo mentalities in order to retain control.

These obstacles reflect what Argyris and Schön (1978, 1996) refer to as Model I theory-in-use and are effective only in encouraging single loop learning where existing theories-in-use are reinforced. This equates with Boyle's (2004) 'opinion based' practice mentioned earlier. The adoption of this type of model leads to an organization where everyone minds his/her own patch (silo mentality) and is resistant

to change. Here individuals demonstrate an inability to challenge the current organizational paradigms. This can lead to poor organizational performance, poor morale among staff and unmanageability.

Argyris and Schön (1978, 1996) propose Model II theory-in-use, as a more positive alternative scenario. Model II promotes free flow of timely and transparent information, delegation and empowerment in decision making and a mechanism to question current organizational paradigms and assess their worth. This model may prove useful where the systemization of ICT into TL&A is being attempted, given the paradigm shifts in pedagogy and academic work practices, which may ensue. Embracing such an approach, can result in minimal defensiveness, greater personal fulfilment, an atmosphere of collaboration and willingness to transform. Model II is necessary for double loop learning where theories-in-use are changed, and also for deutero-learning where the learning process itself is examined and improved upon. Organizational learning interventions, much like changes in strategic focus, are aimed at helping secure a transformation from Model I to Model II thinking in organizational members. Thus they attempt to:

- help identify current organizational theories-in-use and their effects
- identify and development more effective theories-in-use
- develop an iterative cycle to monitor and improve the learning process.

Van der Heijden and Eden (2000) and Argyris and Schön (1996) both identify a concept called organizational enquiry here. Argyris and Schön (1996) continued to develop their theory of action perspective (1978) through organizational enquiry where members of an organization either reflect as individuals or as groups, and pose more and more searching questions about the contribution their role is making to the organization.

Learning organization maturity may prove beneficial where change is a constant and has a major impact in a business process transformation project like the integration of ICT into TL&A. Focusing on deutero learning by members of the organization can lead to successful outcomes. The adoption of such a model avoids what Bates (2000, p 181) acknowledges as the dichotomy between centralized and distributed technology management aspirations in higher education:



*“When it comes to organizational structures, the challenge is to develop a system that encourages teaching units to be innovative and be able to respond quickly to changes in subject matter, student needs, and technology. At the same time, redundancy and conflicting standards and policies across the institute must be avoided”.*

In this the organization must develop the ability to quickly adapt using a learning approach which is seamlessly integrated at individual, departmental and overall institutional level with interactions occurring both at individual, departmental and organizational levels. Figure 10 below summarizes this theme in that it depicts the myriad interactions which are ongoing organically on a continuous basis, both horizontally and vertically in a modern complex organization.

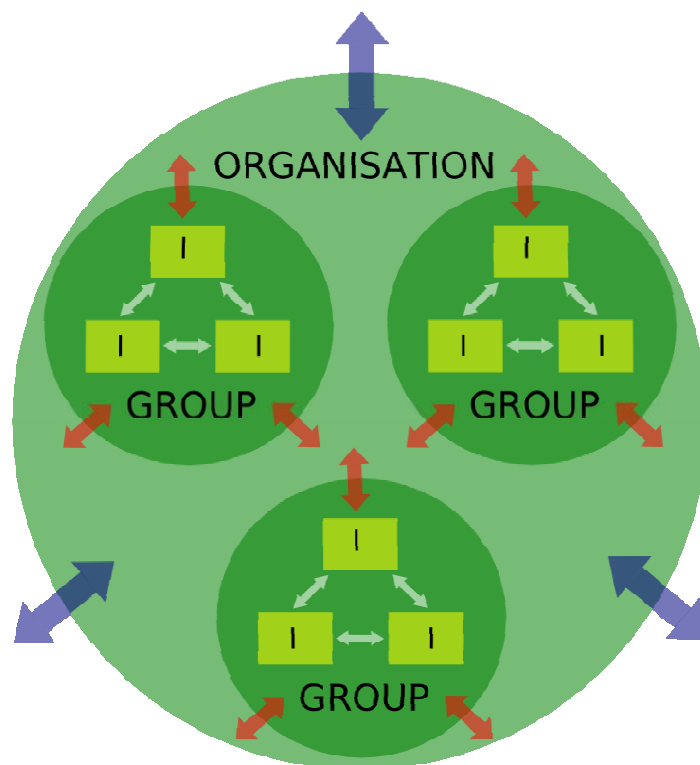


Figure 10. Multi-level Interactions

Integrating ICT into TL&A simply because it reflects societal changes and, perhaps, because it might address the needs of a diverse student body can be a flawed strategy. Adopting this strategy demonstrates what Argyris and Schön (1978, 1996) advise above as single loop organizational learning. Instead higher education institutes need to use an evidence-based approach (Kirkwood and Price 2006) to assessing the appropriateness and adequacy of their existing models, pedagogic strategies, and policies, rather than simply accepting what they believe to be correct.

This learning can be used by higher education institutes to deploy correct ICT-supported pedagogies that strategically fit the desired educational model and the strategic direction of the organization. Adopting this approach may mitigate against purely technology driven strategies. Recent empirical studies, such as those by Zemsky and Massy (2004) and Collis and Van der Wende (2002) and others have found that although ICT systems have been widely adopted into TL&A there was little or no change to the pedagogical model. There was also scant evidence of initiatives into measuring how ICT might improve learning methods or outcomes, again reflecting the single loop view of organizational learning in this area, which is common in higher education currently.

A recent eLearning strategy document from the Higher Education Funding Council for England (HEFCE, 2005) supports the view that institutional approaches should focus more on student centred learning. Kirkwood (2006) and Mac Labhrainn et al (2006) advise where ICT is pedagogically integrated into course design for TL&A, it can enable and support enhanced forms of learning. Kirkwood & Price (2006) propose that effective use of ICT in TL&A necessitates more than simply replicating or supplementing existing pedagogical methods, but in addition advise that everything governing those practices must be reconsidered and reflected upon. This requires a holistic view of the institute's policies, practices, and professional development activities. Holism is innate to systems thinking and learning organization maturity. Again this learning organization maturity approach demonstrates elements of both Senge's (1990) systems perspective and Argyris and Schön (1978, 1996) deutero-learning model of the learning organization in these themes.

The analysis of literature into strategic thinking leads the writer back to the topic of organizational learning. This theme has emerged as a way of addressing problems posed by a rapidly changing environment where what worked well yesterday may not work today and solutions to these problems posed need to be dealt with in ever shortening timeframes. Although organizational learning was first talked about by March and Simon (1958) it has only really become central to organizational thinking since the early nineties, mainly prompted by Senge's (1990) seminal work. Crossan & Berdrow (2003) advise that organizational learning is integral to organizational strategic renewal. Senge (1990), talks about people acting in concert with one another in ways which are essentially creative. This is analogous with Mintzberg (1994) observations, when he describes how successful strategies are not

necessarily outlined in advance, but emergent. Ciborra (2001) also shows parallels here when he talks about improvisation in understanding strategy as an emergent process. The key here is that the atmosphere created by an entity which adopts a learning organization maturity framework allows for the free flow of emergent strategic ideas. Pedler et al (1997) in their exposition of this theme surmise that a learning organization is one which continually transforms itself. This equates with an organization engaged with a healthy iterative strategic lifecycle, where a culture of strategic thinking exists which allows it to continually adapt to a changing environment. This is described succinctly by Pedler et al below:

*"A Learning Company is an organization that facilitates the learning of all its members and continually transforms itself." (Pedler et al., 1997, p 1)*

Skyrme's (2006) definition also emphasizes the links between a strategically aware organization and a learning organization. For example if we were to replace the words learning and sustainable with the word strategic, this definition would fit easily with many writers ideas on strategic thinking.

*"Learning organizations are those that have in place systems, mechanisms and processes, that are used to continually enhance their capabilities and those who work with it or for it, to achieve sustainable objectives - for themselves and the communities in which they participate." (Skyrme, 2006, www.skyrme.com)*

Arising from the disquisition on learning organizations within the literature and the crossover between themes such as strategic thinking, organizational learning and systems thinking, strategic documents combining these various themes are now emerging. Indeed there is evidence of these types of documents in the higher education sector. The Waikato University New Zealand FMD department strategic plan, with the specific strategic goal of providing a learning organization, is one such example of this. Table 1 below underpins the learning organization theme by delineating strategies to deliver this to employees. The crucial link between employee's contribution and strategic direction is recognised and supported here.

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### 1.2.1 Goal:

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- Provide personal development opportunities to ensure each staff member reaches their full potential for success

Strategies:

- Create a learning organization.
  - Develop a professional development plan for each employee as part of the performance feedback process, consistent with the University's needs.
  - Provide training required by regulatory or professional organizations.
  - Participate in learning forums to develop technical skills, mentoring, apprenticeships, networking, and on-the-job training.
  - Fund training as a high priority.
- 

Table 1. Extract from FMD strategic plan p 2.

Another example of this type of document is from University College Cork (Hyland 2004) entitled "University College Cork as a Learning Organization". In this Hyland refers to Stahl et al (1992) where she states a learning organization approach transforms the strategy, structure and culture of the enterprise itself into a learning system. In 2004 University College Cork through its staff enhancement and development committee, produced a 142 page report, edited by Aine Hyland, on the theme of the University as a learning organization. The key theme arising from the collection of articles here was that all employees are encouraged to engage in reflective practice in what they do while the organization simultaneously recognises, supports and encourages this reflection. The idea that everyone has a part to play and that staff need not be over dependent on lead researchers for self realisation in their professional lives was also emphasised in this report.

Can we say that the concept of the learning organization maturity framework has merit, in trying to interpret the strategic mechanisms of the IOTs such as for example strategies for the integration of ICT into TL&A ? A higher education institute is both intrinsically and overtly founded on the idea of the importance of learning at individual, departmental, institutional and societal levels and that learning is the basis for the development and progression of the organization as a whole. The idea of an academic is that he/she can as part of their professional life, explore new ideas and new ways of thinking and doing things, such as for example integrating ICT into TL&A. They may engage with this as individuals and on other levels where learning may occur within groups or within departments. Dill (1999) and Willcoxson (2000) and many others have found that even given these synergies between an academic's *raison d'être* and the themes underpinning the learning organization, in reality the concept of the learning organization within higher education institutes has not yet become extensively established. However Collie & Taylor (2004) in their empirical study found a positive link between the learning organization framework and

improvements in teaching. Hyland (2004), White & Weathersby (2005), Gouthro et al (2006) and others support in their discussions the idea that a higher education institute can become a learning organization.

When we investigate organizational strategies, which assist efficient integration of ICT into TL&A, we are probably looking at how easily an organization learns. Sprenger et al (in Buskermolen et al, 2000) highlight four competences of the learning organization:

- Absorptive power (the capacity to incorporate new knowledge in the organization)
- Diffusion capacity (the capacity to disseminate knowledge within the organization)
- Generative power (the capacity to develop new knowledge within the organization)
- Exploitation capacity (the capacity to use the knowledge present in the organization)

Sprenger et al's (2000) competences give us four themes which if measurable would give a good indicator as to how an organization might fare on a learning organization scale. The difficulty lies in the measurement. Stalmeier (2006) provides a guide as to what we need to examine from an organizational learning perspective. Table 2 below, presents a summary of the general organizational characteristics required for successful innovation as identified from Mac Labhainn et al (2006).

Mac Labhainn et al (2006), comprises of a group of articles on the theme of eCompetence for academics submitted by researchers from across Europe. Although these articles describe the implementation of specific ICT projects in sample universities against a five phase framework, using a case study format, they do not come to many common conclusions around learning organizations and ICT. The main commonality expressed across the case studies, was that of senior management support for the projects involved with the main recommendation in conclusion being the requirement for further collaboration and research in this field.

Pfeffer and De Vries (2006) examined a series of effective practices in their work on the successful integration of ICT into TL&A. Their model below in figure 11 attempts

to describe the complex interaction between technologies, processes and actors in these practices listed in table 2. This model in figure 11 displays synergies with the discussion on the learning organization whereby an actor's awareness sits not only at individual but also at departmental and organizational level.

<i>Innovation process and expertise</i>	<i>Organizational culture and prior conditions</i>
The intended innovation policy of the organization is clear	The communication within the organization is good
The nature of the innovation the organization advocates is clear	The organization rewards willingness to change
Within the organization there is consensus of opinion about the (innovation) policy	The organization stimulates constructive collaboration between and within departments
In the organization educational innovation is centrally managed	The organization is considered to be a forerunner in innovation
The consequences of the innovation policy of the organization for the department are clear	Creativity and flexibility are valued in the organization
Within the organization you as a manager are supported when developing a competence policy	Agreements are always fulfilled in the organization
Within the organization there is expertise concerning innovation processes and ICT	The organization has a good technical infrastructure
Within the organization you can make use of the expertise of other staff members	The organization has sufficient resources for educational innovation

Table 2. General characteristics of the 'innovation-ready'  
Organization Mac Labhrainn et al (2006, p. 39).

Their empirical research based around a model of networked education (Figure 11) also outlined the varying emphases along a continuum of institutes in relation to the integration of ICT into TL&A. Some organizations placed more emphasis on the didactic aspects of the process, while others were more focused on the technology.

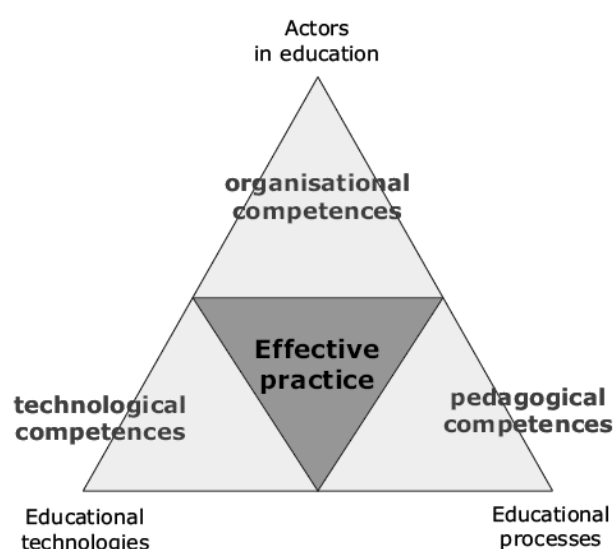


Figure 11: A framework for the analysis of effective practices in the use of educational technologies Mac Labhrainn et al (2006) p 213

All organizations displaying effective practice in this study had invested significant effort in ongoing, regular web technology training for academics. Figure 11 describes

a model which depicts the necessary and increasingly involved interactions between didactics, technologies and organizational competences in the social system of a higher education institute. This theme echoes ideas around organizational learning explored elsewhere in this study in that it clearly identifies and supports the interrelatedness of the individual and the organization in learning the most effective use of technology in education.

Some recent studies in 2005 in the Netherlands by the SURF Foundation focused on the strategic development of policy in relation to how ICT is integrated into TL&A. The findings were inconclusive in so far as there was no definite model which dominated. Top-down or a centralised approach and bottom up a decentralised approach were both identified in this study. However a blend of these was found to be the more likely reality in relation to policy development in this area. Some of the findings by De Vries and Juist (2005) in relation to successful projects were:

- take a step-by-step approach
- make sure you really enhance the target group
- use blended learning
- use a simple eLearning environment (LMS), which will do the job in most cases
- use established technology
- provide opportunities for interaction and collaboration
- use the LMS to introduce educational services step-by-step
- design the LMS-use specifically for this purpose
- take advantage of use of user-curiosity - a never-ending vehicle for innovation.

What Switzer (1992) outlines as institutional commitment from a systems perspective is what is needed for the successful integration of ICT into TL&A within an organization. This can encompass a significant change management project. All components must be in place for a successful implementation. Fullan (1993, p. 24) describes this thus:

*“When complex change is involved, people do not and cannot change by being told to do so. Effective change agents neither embrace nor ignore mandates. They use them as catalysts to re-examine what they are doing”*

Fullan (1991) also emphasizes that the real goal for introducing innovations can be to change the culture of an organization, not implementing the innovation itself. McCormick (1991, p. 28) also writing on the topic of innovation in pedagogy as a:

*'normative re-educative process which enables teachers to change their beliefs, values, knowledge, skills, roles and relationships so that curriculum change may take place'*

Both the re-examination and the re-education described here are reflective once again of Argyris and Schön (1978, 1996) learning loops. It follows that successfully introducing innovations across a higher education institute is achieved by transforming its culture, which requires everyone to be engaged with change agents (Uys 2003). Integrating ICT into TL&A systematically affects almost every facet of the organization and the individuals therein. The change process managers involved must be aware of this. When the integration of ICT into TL&A is engaged with, on anything other than a small scale, delicate negotiations will ensue. All stakeholders (Baldrige 2006) involved such as management, computer services, library, student administration areas etc., in addition to academics must be included in the process and be allowed buy-in to the project. In addition, issues raised by the integration of ICT into TL&A can be complicated (Nicol et al 2004) and may require extended sessions to resolve. Thus a project like this may take a number of years to roll out completely. The longevity here is why an organization displaying learning organization traits may have a better chance of succeeding, given its ability to accept continuous change. One key relationship here, is that between central computer services and the teaching support units within the academic departments of the higher education institute and the need for these two groups to be integrated and work more closely together in order to help underpin successful implementations.

As part of the exposition on the integration of ICT into TL&A the literature discusses elements both of bottom-up i.e. innovators/enthusiasts/early adopters and top down i.e. organization ICT strategies. Yetton et al. (1997), attempt to capture this as part of their two stage model. This model because of its nature does not reveal the organic nature of such a process, where timing elements and reiteration in the various stages need to be described. Thus we cannot see elements of Argyris and Schön (1978, 1996) learning loops here explicitly. Change and adaptation need to be shown where something that was not working demanded corrective action. The strategic framework for the overall process, which harnesses compatibilities between the two



approaches, needs also to be described. A more holistic description of the process might be what Bates (2000) describes when he talks about emergent strategies. Emergent strategies are probably more prevalent in new processes such as the integration of ICT in TL&A.

Johnston (2000) and Hennessy et al (2005) found from their experience in the exploration of the subject of the integration of ICT into TL&A, that although projects here may have set out with an overall aim there was much evidence of emergent strategies as a response to issues during the project life cycle. This is in keeping with reality of many such projects and displays elements requiring a learning and adaptive process. Mintzberg (1994) finds that most successful strategies are never completely outlined in advance. Bates (2000) advises it may take several years for the cost of integrating ICT into TL&A to be justified by evidence of improved learner outcomes.

### **3.4 Learning Organization Maturity & Academia**

There is substantial evidence of the integration of ICT into TL&A in higher education at presently, as witnessed by the deployment of digital media in the classroom, the ubiquitous availability of computing (Hawkins et al, 2002, Smith 2003, SURF 2004, Weckmann & Engert 2005) facilities to both staff and students and the installation of some form of learning management system (LMS) in most higher education institutes at this juncture. This ubiquitous deployment of technology is aimed at instilling digital competence in the students and staff of higher education institutes. However as Stenhammer (2006), points out, instilling digital competence in academics through the promotion of a life long learning environment is also critical. In Stenhammer's institute Bodo University College, Norway, the service level agreement with students stated that it should provide active use of eLearning systems as a supplement to other teaching methods on all its courses. This was backed up by a 'Competence Project' for its employees. This perhaps is a good example of where the strategic intent is being carried through to the operational level. In many higher education institutes the process of taking strategic intent through to operations is seen as informal, and as a result may not happen effectively, whereas formalization as in the above example may prove more beneficial.

The appropriation (Taylor 1998) by academics of ICT into TL&A may be obstructed by the continued use of traditional teaching and examination methods, in the new environment. This implies the necessity for a re-examination and questioning of

current delivery methods, which can fit into a learning organization maturity discussion, as part of the appropriation process. This re-examination may give rise to major organizational and cultural issues which may not easily be addressed without a cohesive strategic plan for the integration of ICT into TL&A. In this, as Lefrere and Mason (2003) highlighted in their paper, trust from both people involvement and the technologies employed is critical to success. The OECD stresses that:

*The concepts of “knowledge economy” and “knowledge worker” are based on the view that information and knowledge are at the centre of economic growth and development. The ability to produce and use information effectively is thus a vital source of skills for many individuals.*  
(OECD 2001, p. 100)

Hagner and Schneebeck (2000) advise that engaging the faculty is the most important aspect of securing the successful integration of ICT into TL&A. Thus the challenge for today's higher education institutes is to create an atmosphere which encourages academics not to feel threatened by new technologies. Kirkwood & Price (2006) identified in their research in the UK, that academics conceived that their actions in teaching and learning were in supporting learning and problem solving whereas the theory in use (Argyris and Schön 1974), was that their actions were in fact based on knowledge transmission. Kirkwood & Price (2006) also go on to propose that there is a distinct lack of evidence to date of double loop (Argyris and Schön 1978, 1996) learning in higher education institutes in relation to the integration of ICT in TL&A. The reason for this may be the newness of the domain and thus the lack of detailed empirical research on which to develop a database on current processes and thus somehow identify best practice.

Targeted professional development programs (PDP) (Marquardt 2002), are a key ingredient for engaging the faculty in the integration of ICT into TL&A. These PDPs should not only address new ways of teaching, using technology, but also question the strategies that underpin the pedagogical methods in situ. Research in this area, for example Williams (2003), has found that many professional development programs around the integration of ICT into TL&A, are based on improving technical skills and very little attention is paid to how this can transform teaching and learning within the new technological environment. In the main technology is being used to re-enforce current practice and thus institutes and academics are avoiding the exploration of new ways in which to practice.

There may also be a fear factor in relation to professional development, in that academics may view the integration of ICT into TLA as a tool management are employing in order to change their roles and in so doing effect their terms and conditions of employment. The culture of fear may relate to what Palmer (1999) describes as the privatization of teaching, which arises where academics are not engaged with or supported by an attractive professional development system, and thus tend to be closed and conservative about the evolution of their teaching practice. Fear and blame are also highlighted in the works of Vince & Saleem (2004) in their study of a public service organization where they highlight the lack of empirical evidence examining the links between emotion and organizational learning. Similarly Coopey (1995), Blackler and McDonald (2000) and Ferdinand (2004) in their work have noted the lack of empirical work relating to the connection between power and politics and organizational learning. The writer acknowledges these revelations and the huge impacts, interplays and interactions power, politics and emotions contribute to the organizational learning discussion. Vince (2001) presents a case study in which he focuses on the idea of organizational dynamics where he explores how the interplay between emotion and power contribute to a political and social atmosphere which allows learning and organising to thrive. In this work he clearly states that he is not referring to the combination of individual learning and its contribution to the organization as a whole which is the main theme in the learning organization aspect of this study. Garvin (1993) suggests that some definitions of the learning organization may be too fluid whereas his ideas suggest more concrete definitions. So there is a wide spectrum of flexible definitions in the literature in the discussion on the learning organization. Here the scope and objectives of this cross-sectional study is focused on the structural (Nyhan et al, 2004) i.e. the learning organization rather than the cultural (Nyhan et al, 2004) i.e. the organizational learning agenda.

Kirkwood & Price (2006) argue, that the lack of empirical evidence and research on the subject of teaching and ICT in combination, is indicative of many organization's lack of willingness or ability to tackle this complexity. They also allude to the idea that professional development may be viewed as a panacea to all institutional problems relating to the integration of ICT into TL&A. To mitigate this, Kirkwood & Price (2006) point to the requirement that professional development needs to go beyond the academic as an individual and transcend the organization as a whole to include

groups, managers and support staff in an effort to somehow fit within the organizational vision here.

This thinking again reminds us of elements of the learning organization maturity theme where awareness that organizational change must address the needs of varying levels, from the individual through departmental to organizational level, in order to successfully effect change. There is some evidence in the IOT sector in Ireland of attempts to integrate professional development with strategic intent, under the Performance Management Development System (PMDS) as mentioned in Chapter I. Introduced in 2005, PMDS is a process which was tied to national pay agreements under a partnership umbrella. In this process, the organizational strategic plan is disseminated to all departments where an operational plan identifying themes to support the overall plan is developed in a top down approach. Then each individual goes through a PMDS process called a personal development plan (PDP Marquardt 2002) with his/her line manager, the outcomes of which are a set of professional development goals in line with their professional role within the higher education institute and in keeping with the departmental plan agreed which in turn underpins the overall strategic direction of the organization. These processes are reflective of Senge's (1990) systems thinking ideas. The training outcomes identified from the individual PDP process are forwarded to the Human Resources department for validation and decision on and facilitation of action. The evidence of engagement with the PMDS process has as of yet to be tabulated. While PMDS may signify efforts to in some way to engage the faculty and other factions, in an organization learning maturity way, it may by its very nature, because of its top down approach, lack what many writers call the 'collegial' element of professional development in relation to teaching and learning.

Amundsen et al (2005) write about the essential role of colleagues in professional development to enable reflection on, and the enhancement of the theory and methods of excellence in teaching. The ability of the methodology taken to bridge the gap between what the organization and the professional group desire is crucial to a professional development process as part of the integration ICT into TL&A. Empirical evidence of this type of participative collegial approach to professional development in the integration ICT into TL&A from an improvement in teaching perspective is limited, again possibly because of the newness of research in this domain. Eib & Miller (2006) in their paper on this topic, have identified some evidence of success in

their examples of communities of practice in faculty development at Calgary University.

Various aspects of the effects on academic staff in relation to the integration of ICT into TL&A have been raised in the literature. These cases range from radical examples to the more common theme of a blended approach. Scott (2000) describes the radical example of Carnegie Mellon University where it was suggested that the traditional academic would be replaced by electronic tutors, in the future. In the main however writers on the subject suggest that the bulk of the integration of ICT into TL&A, will be in a blended learning environment where academics will employ the technology to supplement rather than replace traditional teaching methods. This message needs to be communicated clearly, if we are to encourage and engage academics to adopt technology into their work practices. In this as Serwatka (2002) advises, delivery methods will have to be reviewed and indeed modified, where they do not fit within the changed TL&A environment.

The question also arises here whether an academic has an opportunity to contribute to strategy development in relation to the integration of ICT into TLA. The PMDS process in the IOT sector, outlined above, where departmental operational plans, supporting overall organizational strategic intent could be a useful example, where collegial input is included as part of the process. Previous studies such as Kop et al (2004) would indicate that this may not be the case. Kop et al (2004) suggest a key element in relation to the success of the integration of ICT into TL&A, is to have a clearly aligned policy of professional development for the academic staff. Allied to this is the establishment of support roles with expertise in teaching and learning technologists for learning management systems. The goodwill of champions among academic staff is insufficient here. The issue needs addressing with a proper staffing policy and structure.

The language used around the integration of ICT into TL&A can often mean different things to different academics. For example in the case of eLearning the following might be the varying interpretations. Is it just material available on the internet? Is it the use of interactive tools such as email, instant messaging, pod casting etc.? Does it mean a subject is totally online or in a blended environment? Or is it a combination of some or all of the above? From this it is clear that language used relating to the

level of integration must be clearly explained and understood by academics from the outset.

The idea of the integration of ICT into TL&A can present grave difficulties for staff who are not confident users of computers in the first instance. The pace of change of ICT technologies itself can make many academics feel out of their depth pretty quickly. So it must be appreciated by those promoting the integration of ICT into TL&A that many academics find it difficult to work in an environment of constant change where everyone is learning as they go.

The questions around intellectual property (IP) rights may also be bolstering a conservative approach to engagement. Here delivery is changing from the scenario of a more intimate relationship with the student where lecture notes are between teacher and student, to a scenario where lecture notes may be available in a more public forum, and thus open to scrutiny from all. Academics are the key stakeholders in relation to the successful integration of ICT into TL&A. They are if you like the lead actors in relation to bringing innovation to teaching.

Do higher education institutes measure individual competencies in relation to integration of ICT into TL&A? Is there a clear definition of what is meant by competence in relation to the use of ICT by academics in TL&A? Weinert (2001) as quoted in Mac Labhrainn et al (2006 p 29) describes competence as

*"...a roughly specialized system of abilities, proficiencies, or skills, that are necessary to reach a specific goal. This can be applied to individual dispositions or to the distribution of such dispositions within a social group or an institute"*

Technological competence or eCompetence is part of what higher education institutes currently seek from their academic and indeed other staff cohorts. As a result of the significance of this quest, many projects on the topic of eCompetence have been and are being supported by the EU and other bodies involved in education research. From the EU perspective one example of such a project is the recently launched European eCompetence Initiative. eCompetence is important as Graves (2001) describes in that where academic staff gain an understanding of how technology can be employed in their teaching and research activities, it can then be used to enhance these activities. From this it is clear, as Stalmeier (2006) asserts,

that eCompetence for an academic is much more than simply being skilled in the use of technology. It must also include having the ability to discern which areas of the academic process best suit the application of ICT. Schneckenberg and Wildt (2006), in their paper entitled 'Understanding the Concept of ECompetence for Academic Staff' in Mac Labhainn et al (2006), suggest that if we are to examine holistically the precept of eCompetence we must be aware of how this relates to the individual and to the organization, as a whole. Again this echoes themes from Argyris and Schön (1978, 1996) exposition on the learning organization and Senge's (1990) systems thinking narrative.

The term e-support is used to cover support services for academic staff in their quest for eCompetence. Some higher education institutes e.g. the University of Pretoria in South Africa as described by Fresen et al (2006) in Mac Labhainn et al (2006) have introduced administration systems to monitor the deployment of e-support. As further evidence of strategic commitment in this area the University of Pretoria created the Department of Telematic Learning and Education Innovation in 1997 to promote excellence in teaching and learning through supporting academics. In Europe for example, the University of Duisburg-Essen, in Germany, introduced an E-Strategy in 2006, following on from its eCompetence Initiative (2003-2005), in order to integrate eLearning with other core ICT support processes. In its eCompetence initiative, a small team of specialists used coaching and other methods to build academics eCompetence level. These kinds of cases help demonstrate the efforts being made to bridge the gap between early adopters of integration of ICT into TL&A and the remainder of academics as described by Engert & Kerres (2006) or in Rogers (1995) terms the early late majority. This study specifically chooses the term the integration of ICT in TL&A, rather than simply a study of eLearning for reasons similar to those described by Pfeffer and De Vries (2006). They identify the importance of such descriptions to allow for varying aspects of the subject such as the role of ICT in enhancing delivery, alongside the necessity of teaching information literacy as part of a student's grooming for his/her role in the information society.

Russell (1999) has found that the integration of ICT into TL&A may not show substantial improvements in student performance. Other such as Postman (2000) suggest that it may even impose impediments on the diversity of pedagogical processes. Bigum (1997) writes that the ubiquitous nature of ICT in education is related to some sort of control agenda by governments, springing from the requirements of transparency in education processes in the information society.

Again what Bigum (1997) alludes to here, is that the mere imposition of ICT from on high will not on its own lead to successful outcomes.

Finally in this section the writer feels it is import to articulate why the learning organization framework was chosen as part of a study examining the appropriation by academics of ICT into TLA in the IOTs in Ireland. Here as Kirkwood and Price (2006) suggest higher education institutes need to embrace Argyris and Schön (1978,1996) double loop learning techniques in order to develop the strategies necessary to support pedagogical models and policies in CPD to allow for the seamless integration of ICT into TLA. This thinking needs to be devolved to academics in the IOTs. So for example where a group of academics within a department agree to deploy a programme of study on an LMS this should include them reflecting on for example what changes they may need to make to in their face-to-face interactions with students as a result of this initiative. This could mean for instance a move away from formal lectures and the examination of pedagogies such as the introduction of focus groups, peer learning, role play or problem based learning techniques, which will place the student at the centre of learning. When higher education institutes create contexts '*where people are continually learning how to learn together*' (Senge 1990, p. 2), then as Patterson (1999) and Hagner and Schneebeck (2000) suggest the faculty are engaged and are in a position to embrace new technologies into their work practices. Evidence that this is beginning to happen in the IOT sector can be gleaned from initiatives like the wide uptake of LMS's (100% of respondents in this study report using one in lecture preparation), and the establishing of national databases of reusable content by the cross sector Learning Innovation Network in 2007.

### **3.5 The Technology**

The IOTs (formerly called Regional Technical Colleges) have been associated with technology and innovation since their foundation about 38 years ago. Indeed in their founding legislation the Regional Technical Colleges Act(s) state that an IOT is "to provide training for the economic, *technological*, *scientific* vocational and *technical* education and, *commercial*, *industrial*, social and cultural development of the State with particular reference to the region served by the college". This enactment then clearly places IOTs at the heart of technology and innovation in Ireland. There are two tenants to the idea of technology and innovation in the IOTs. First there is the idea of the use of technology to enhance the operations of the institutes from an



administration and teaching perspective. Second is the idea that the IOTs through research engage in the development and diffusion of new technologies and innovations.

From a national perspective IOTs contribute financially and are represented on the boards of two important national ICT deployment organizations. They are An Cheim which controls the student, HR and financial administration systems in the IOTs and HEANET which controls the intra university and IOT research network nationally, a role similar to that of JISC in the UK. Dewett and Jones (2001) clearly demonstrate the ICTs influence how organization characteristics such as structure, size, learning and culture link to organizational outcomes such as enabling employees, codifying (Cornford and Pollock 2003) the knowledge base and increasing boundary spanning. This is true of the IOTs were for example the diffusion of the SCT Banner student administration systems has facilitated the codification of the knowledge base on student information across the sector.

Analogous to this is the role of the IOT in developing and diffusion of new innovations and technologies. The IOTs are clearly aware of their role in the “triple helix” of industry government and higher education, as described in Etzkowitz (2008), through their founding legislation mentioned earlier and through the proactive policies and strategies they pursue in this regard. These strategies are actualised in the numerous innovation incubation centres established on IOT campuses in partnership with Enterprise Ireland the Irish industrial development board in recent times. These centres provide training and incubation space for new SME start-ups, as well as advice on technology transfer from applied research to production for prospective spin off companies from the IOTs, similar if on a smaller scale to the work described by Smilor et al (2007) which is happening in the United States.

One aspect arising from the literature is that the reliability of the technology (BECTA 2004) is a key factor for successful integration of ICT into TL&A. This is particularly significant where you might have a body of academics who are cautious and sceptical about its merits prior to adoption. Seamless integration between systems e.g. between student administration, academic administration and learning management systems is of critical importance here. In many instances this is still on the way to being achieved.

The most significant developments in the technology arena presently are the emergence and take up of mobile technology. In November 2007 the total number of mobile phone subscribers in the world was in excess of 3.0 billion, up 100% from 1.5 billion in 2004, according to research by the Mobile World (2008) a market data and analysis UK based company focused exclusively on the mobile telecommunications sector. In Ireland there are an estimated 8 million mobile handsets (RTE news 2007) for a population of about 4 million. With the arrival of 3g higher bandwidth, combined with pda/pocket pc/phone devices, it is now potentially possible for any student to access any online content, at any time from anywhere. The costs involved presently, being probably the key inhibiting factor to wider uptake here. The content can in fact be delivered directly, in a scheduled manner if required, to these personal devices using what are known as push technologies. This makes it important for higher education institutes to investigate these technologies in order to access what benefits, if any, exist for eDelivery of their programs . Otherwise the discerning learner may register elsewhere where his/her mobile service requirements can be met. In the arena of emerging technology initiatives, Nicholas Negroponte has developed the one laptop per child program (OLPC) to deliver a cheap laptop to each child involved in education in the US. In Ireland for example the Royal College of Surgeons in Ireland (RSCI) provide laptops to undergraduates on certain programs at registration.

One important element of the technology as outlined in the literature is that it meets standards. Government and trans-government initiatives will play a key role in standards. BECTA a British organization, which promotes excellence in the use of ICT in education, has developed a self review framework to assist institutes in developing effective ICT strategies. The EU eCompetence initiative, referred to earlier, is another example of efforts to move towards standards based practice. These standards should relate to such facets as modularity, granularity, interoperability and customisability, in relation to learning objects as described by Porter (2001). Learning objects are important as they allow ICT based course developers recycle course elements to suit the different pedagogical demand of individual students or program offerings. It is important, as advised by Martinez (2001), that the likelihood of successful learning outcome is greater, if the learner perceives his/her study experience to be safe, positive, and relevant to practice, and that the learning tool employed is compatible with the learning outcomes.

### **3.6 The Learning Support Stakeholder**

The scope of this study does not include a detailed investigation into the integration of ICT in TL&A from the learning support staff perspective. However it is acknowledged that the successful integration of ICT into TL&A is dependent on timely and flexible learning support structures. The organizational changes arising from the integration of ICT into TL&A demand that diverse learning support staff in both the ICT departments and the Library must work synergistically with academics across the organization. The change management process, here from small groups working together more or less in silos to one where all must work synergistically towards the overall strategic direction of the higher education institute, presents a significant challenge for management. In the learning support area new roles such as learning technologists, educational developers, educational researchers, technical developers, materials developers and project managers, may emerge. Professional development paths for more traditional learning support personnel into these new roles should be provided. Collis & Van der Wende (2002), in their international study on the integration of ICT into TL&A, found that academics and learning support staff were among the key personnel involved in successful integration. This seminal work was further built on and referenced by many researchers including De Boer in his 2004 thesis titled, "Flexibility Support for a Changing University", and by Petra Boezeroy in her work entitled "ELearning Strategies in Higher Education" (2006). One of the findings of Collis & Van der Wende (2002) was that learning support staff perceived the integration of ICT into TL&A more positively than the academics actually using ICT in TL&A. This could be considered a natural conclusion as it is only human nature for one to eulogize one's chosen career field. The view of academics was that support from learning support staff was slightly above average.

The Performance Management Development Process (PMDS) process, as outlined in an earlier section of this discussion, in the IOT sector in Ireland, could loosely be described as an effort at the change management process to transform the organization culture, including learning support staff, from one of a silo mentality or as Argyris and Schön (1978, 1996) describe as one where single loop learning only takes place, to one where awareness of how what one does as an individual or small group fits in with the overall strategic direction of the organization i.e. Argyris and Schön (1978, 1996) double loop learning and Senge's (1990) systems thinking. As commented earlier the jury is still out on the success or otherwise of the implementation of PMDS.

### 3.7 Summary

As a continuum from Chapter II the evolution of strategic thinking into systems thinking, as a way to understanding the complexities of strategic formulation in modern organizations, and how this applies to higher education institutes in their efforts to integrate ICT into TL&A was explored in Chapter III. The discussion evolved through Mintzberg's (1994) schools through Baldrige (2006) systems perspective in education to Argyris and Schön (1978, 1996) learning loops and Senge's (1990) systems thinking. This idea of learning loops was explored further and compared with individual attitude to innovation and change. The various levels of learning and understanding for the organization are explored through, in the main, Argyris and Schön (1978, 1996) writings on the subject. Hyland (2004), White & Weathersby (2005), Gouthro et al (2006) and others in the literature suggest there is merit in HEIs adopting the learning organization approach.

The model in Figure 12 summaries the journey through Chapter III on how the learning organization concept may be contextualised in this study as a framework for comparison of ICT integration into TL&A in the IOT sector in Ireland. In this model the cyclist represents some of the elements of the learning organization which have been discussed during this chapter. The bicycle in the model represents the actualisation or operationalization of these elements into some of the realities necessary for the successful integration of ICT into TL&A within the organization. The model overall represents the learning organization moving forward with elements and actualities working in harmony to underpin the organization's progress and adaptation in new directions and to new circumstances.

As part of the disquisition in Chapter III an exploration of what the norm associated with organizational learning based on the theory, and what needs to happen in order for an entity to become a learning organization, ensued. Here obstacles to achieving learning organization maturity are identified. To achieve maturity a organization must empower individuals to become involved in strategic development lifecycle on a continuous basis. Individuals must become aware of what their role means to themselves, their peers their departments and their institutes. Some examples of where learning organization maturity is used in strategic documents where high lighted. Key ingredients required for achieving learning organization maturity where also presented form various writers in the literature. Collie & Taylor (2004), Hyland

(2004), White & Weathersby (2005), Gouthro et al (2006) and others produced work on the learning organisation in the context of higher education.

## The Learning Organisation Elements & Actualisations

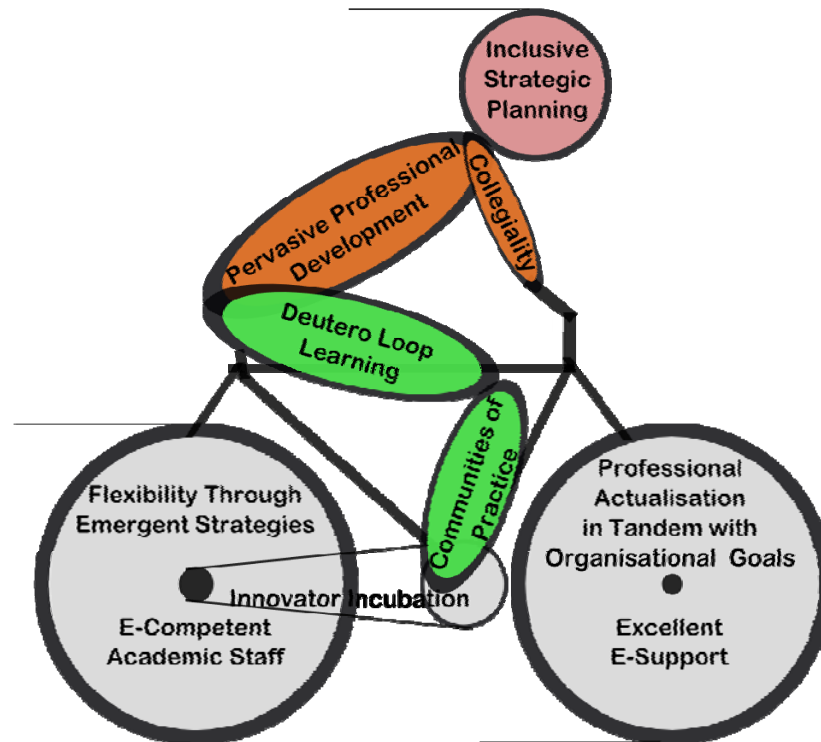


Figure 12 The Learning Organization.

The writer acknowledges discussions in the literature by researchers such as Vince (2001), Coopey (1995), Blackler and McDonald (2000) and Ferdinand (2004) which relates to power and politics in organizational change and organizational learning. However the scope and objectives of this cross-sectional study is focused on the structural (Nyhan et al, 2004) i.e. the learning organization rather than the cultural (Nyhan et al, 2004) i.e. the organizational learning agenda.

Patterson (1999) and Hagner and Schneebeck (2000) among others stress the importance of engaging the faculty in the appropriation of ICTs into their work practices. The chapter explored how best this engagement might be achieved against a framework of organizational learning. Kirkwood and Price (2006) support the use of Argyris and Schön (1978, 1996) learning loops in higher education settings. Here professional development programs are examined by many writers as

a means to achieving academia's engagement with this integration process. Unfortunately there is little evidence in this literature explored here on professional development of Argyris and Schön (1978, 1996) double loop learning, which may be indicative of an inability on the part of higher education institutes to tackle the complexity in this area. Obstacles to engagement, such as fear of change, lack of confidence in / with the technology and intellectual property (IP) rights are briefly explored. In response to these obstacles to progress, many bodies, such as the EU have invested in what we can call generically eCompetence support programs. Again because of the newness of these initiatives the jury is still out on their level of success. This chapter described how IOTs are clearly aware of their role in the "triple helix" of industry government and higher education, as described in Etzkowitz (2008) Finally this chapter acknowledged the importance of other key elements and internal stakeholders peripheral to this study such as the ever evolving technology, and the learning support staff.

## Chapter IV Research Methodology

### 4.1 Introduction

*“One of the greatest pains to human nature is the pain of a new idea. It... makes you think that after all, your favourite notions may be wrong, your firmest beliefs ill-founded... Naturally, therefore, common men hate a new idea, and are disposed more or less to ill-treat the original man who brings it.”-Bagehot (2001 p 92)*

From the literature it is clear that there is still much scope for research in the area of the efficacy of ICT adoption and organizational strategy. Although the literature presents many useful case studies, the actual empirical data available is not yet substantial. Many theories seek answers to long term questions which because of the lack of data cannot yet be fully explored. This study is a small effort at identifying complementarities between organizational learning traits and efficacy of diffusions of ICT in TL&A in the institute of technology higher education sector in Ireland. This falls into the category of research into diffusion of ICT and organizational change as identified by Forman and Goldfarb (2006). Here the study focuses on how the adoption or integration of ICT into TL&A is influenced by the level of learning organization maturity found in the institutes of technology in Ireland. The justification for the approach taken to carry out this work will be explored next.

The methodology chosen was naturally constrained by factors such as time, cost and access to the organizations / individuals required to participate in the study. A mixed method (Bryman 1988) approach might have been employed here had more resources been available to the writer. Thus if time and resource had allowed, some structured interviews with targeted audience sample, to make up for any perceived the shortfall in the survey data may have ensued. However Bryman (1988) cautions at the imagined right to increased triangulation this approach may have bestowed. In the end because of the above and the fact that there were 13 IOTs targeted for data collection a mono method approach employing eResearch (Anderson & Kanuka 2002, Paterson et al 2007) techniques was taken. Overall the study fits well with the idea of deductive theory as described in Bryman and Bell (2007 p 11), in that it looks at theory, develops research question(s), gathers empirical data, posits analysed data against research question(s) and describes conclusions. Bryman and Bell (2007

p. 11) describe deductive theory as the *commonest view of the nature of the relationship between theory and research*.

This study investigates two data subsets from the population in the target IOTs. It also employed two analogous tools i.e. the LOP and TLA tools in the investigation of the research question. Here distinct subscales within the tools are identified which allow for correlations between traits inherent in these subscales. This approach allows for what Bryman (1988) describes as convergent validity tests which when high results are returned can re-enforce the validity of findings.

While this is a small part-time research employing limited resources, it does raise the age old dichotomy in the epistemological debate between qualitative and quantitative research methodologies, and their appropriate uses. Many writers would discount the approach taken where qualitative type opinion based statements are then aggregated for use in quantitative tests. However other social researchers including Scheerens (1997), Bryman (2001) would take a more pragmatic view in that although they acknowledge the epistemological dichotomies of e.g. positivism versus interpretivism, they also accept that new insights into true knowledge production can be gleaned from combining the strengths of each or indeed accepting that the differences between both may be overstated as argued by Weber (2004). The writer adopts this philosophical approach to research in this study.

Survey research, as employed in this work, be it online or via mail, is well established in the ICT field according to Pinsonneault and Kraemer (1993). Pinsonneault and Kraemer (1993) also contend that when such a method is precisely followed, it can lead to valuable data and as a consequence useful results. However, Pinsonneault and Kraemer (1993) identify a number of potential pitfalls which may arise with this method. They are

- single method designs where multiple methods are needed
- unsystematic and often inadequate sampling procedures,
- low response rates
- weak linkages between units of analysis and respondents
- over reliance on cross-sectional surveys where longitudinal surveys are really needed



In the main the writer is aware of these potential pitfalls and will address them in the following ways. To overcome the deficiencies of a single method design the writer will attempt to identify a well tried tool which embodies Marsland et al's (2005) multi-level model approach. The use of a tried tool should provide systematic sampling procedure. It is hoped to get response rates fit for purpose by personalising invitations to participate. This work lies within the cross-sectional remit and was not intended from the outset to be longitudinal. The writer will chose a tool which is explanatory in nature so that, as Pinsonneault and Kraemer (1993) propose, a causal relationship between variables in the research question and sub questions may be established. The tool selected needs also to allow for aggregation to the unit of analysis which in the main in this study will be the organizational unit i.e. the institute of technology.

In the area of sampling the writer is aware of the two main concerns here i.e. the sampling frame and the representativeness of the data. These issues will be addressed in Chapter V where the focus is on the findings. The study addresses issues around learning organization maturity and the level of integration of ICT into TL&A. Consequentially, the cohorts chosen, as individual respondents i.e. managers and academics, need to reflect adequately these objectives.

## **4.2 Learning Organization Assessment Frameworks**

It is important to identify suitable models and frameworks to examine elements of the learning organization maturity, which may or may not exist in relation to strategic framework for comparable analysis with the integration of ICT into TL&A. The analysis of the strategic processes in ICT integration in the IOTs, in comparison to frameworks outlined by Argyris and Schön (1978, 1996) on the learning organization theme will ensue. The idea of engaging with the learning organization theme may involve a major shift in the cultural paradigm. Stacey (1992) advises that many use the comfort zone of the here and now as a defence mechanism against radical change. Stacey (1992) further contends that fear of loss of control from both management and the individual can form formidable barriers to efforts at cultural change.

Stacey (1992) also contends that in order to counteract these barriers and encourage what he calls complex learning; managers need to focus on managing the context. This context might include elements such as time pressures on people, or the level of

mutual trust between individuals and groups. Managing the context gives people the space and confidence to overcome defence mechanisms and begin questioning their roles and organizational cultural paradigms. Stacey (1992) further argues that the type of culture where the successful management of context exists is indicative of the essence of a learning organization.

Marquardt and Reynolds (1994) outline eight key initiatives that managers need to embrace to achieve successful transformation into a learning organization. These are to:

- Establish a strong sense of urgency about becoming a learning organization
- Form a powerful coalition pushing for organizational learning
- Create the vision of the learning organization
- Communicate and practice the vision
- Remove obstacles that prevent others from acting on the new vision of a learning organization
- Create short-term wins
- Consolidate progress achieved and push for continued movement
- Anchor change in the corporate culture

Various assessment tools have been developed for measuring learning organization capability. In the main these tools adopt a normative perspective based on learning organization attributes arising from the literature. This study will adopt a similar approach in line with its coherence to social research in this domain. To the fore in these normative approaches is the self-assessment likert type scale method such as those developed by Watkins and Marsick (1997), Pedler, Burgoyne and Boydell (1997), Richards and Goh (1995) and Marquardt (2002).

Watkins and Marsick (1997) developed a self assessment likert based tool. In the case of Pedler et al, (1997) they developed likert type questionnaires concerned with measuring areas such as the quality of the learning environment and the organization toxicity index (OTI). These measures allow an estimate of how amenable organizations are to allow their employees opportunities to learn. In the case of Richards and Goh (1995) they developed a likert type tool called the learning organization survey which consisted of 21 questions comprising five sections covering areas such as clarity of mission and vision, leadership commitment and empowerment, experimentation and rewards, effective transfer of knowledge and

teamwork and group problem solving. Richards and Goh (1995) developed this tool in order to measure an organization's learning capability. This tool has been used in many case study analysis e.g. Goh (2003) and was adapted for a study in higher education by Neefe (2001) in a paper on organizational learning maturity in higher education institutes.

While the various tools examined had merits the writer felt Marquardt's (2002) learning organization profile (LOP) tool was found to be the most suitable for this study. The writer with the permission of Professor Michael Marquardt, Professor of Human Resource Development and International Affairs, George Washington University decided to use a slightly adapted version of his tool for data gathering relating to the learning organization maturity element of the study. These adaptations in the main concerned replacing business words with more generic words, which would suit better the context in higher education institutes. In addition as can be seen in Table 3 below some positive statements were changed to negative ones. These adaptations are explored in more detail in section 4.3 of this chapter. Here in table 3 below are some examples of these minor adaptations are described. One of the reasons for this choice was that Marquardt (2002) learning organization profile (LOP) tool is well established in the literature and as such, should not require validation. Also this tool looks at ICT in relation to the learning organization maturity, which fits well with the correlative aspect of the study. In addition the tool is reasonably clear, not too lengthy and unambiguous and so should facilitate more effective data gathering and thus improve survey return.

Q. No.	<i>Marquardt LOP</i>	<i>PM adaptation of Marquardt LOP</i>
1.1	We see continuous learning by all staff as a high business priority	We see continuous learning by all staff as a high priority
2.1	The importance of being a learning organization is not understood throughout the company	The importance of being a learning organization is not understood throughout the organization
3.6	We actively share information with our customers and at the same time obtain their ideas and inputs in order to learn and improve services and products	We do not actively share information with our students, to obtain their ideas and inputs in order to learn and improve our educational programs
4.5	we often create demonstration projects where new ways of developing a product and/or delivering a service are tested	We seldom create demonstration projects where new ways of developing a program and/or delivering a module are tested
5.6	we support just-in-time learning, a system that integrates high-technology learning systems, coaching, and actual work on the job into a single, seamless process	We do not support just-in-time learning, a system that integrates high-technology learning systems,( e.g. moodle or some other LMS) coaching, and traditional teaching in a blended single, seamless process

Table 3: Marquardt LOP Adaptation.

Marquardt's (2002) slightly adapted LOP will be applied to both managers (academic and non-academic) and academics in the IOTs. This will facilitate the gathering of data relating to learning organization maturity which will be analysed using Marsland et al (2005) multi-level model approach. Analysis of the results of both the management and faculty LOP surveys should produce a reasonable indicator for each institute of its learning organization maturity level.

In addition to the LOP survey for faculty a separate tool was developed to gather data around the level of integration of ICT into TL&A. This tool was called the TLA tool and the reasons for its use are elaborated on in section 4.3. The analysis of data retrieved from the TLA tool will enable the writer to develop some measures around the level of integration of ICT into TL&A in each higher education institute in the study. From there the study will progress to the correlation phase, where the level of integration of ICT into TL&A is compared to the state of learning organization maturity in each IOT. Conclusions will then be proposed from these statistical findings.

In addition to rephrasing some of the statements in the Learning Organization Profile (LOP) to have more meaning in a higher education environment, one other change was incorporated. This was the conversion of a balance of positive statements to negative statements. The reason for this is that studies have shown (e.g. Friedman 1988) that all positive statements in a Likert type survey such as Marquardt's LOP, produce slightly different results than all negative statements. Thus the mix of negative statements was included to mitigate bias (Messick 1962, Friedman 1988) in either direction and thus provide a more reasonably balanced score from each respondent.

#### **4.3 Mechanics of Data Collection**

The study will inevitably involve the gathering of ordinal data with respect to individual respondents in order to produce quantitative data for analysis with respect to the research question. The main instrument of data collection will be online survey. The researcher first created a database of contact details of the surveys target audience, including name, position and email address. These audiences come in two main cohorts i.e. the management grades both academic and non-academic and the faculty of the IOTs in Ireland. The survey instruments are available in Appendices I & II for perusal. The cohorts chosen for the purpose of data gathering for the study

were the (academic and non-academic) management and faculty of the IOTs in Ireland. Alreck & Settle (1995) state that it is seldom necessary to sample more than 10% of a given population. The size of the academic population here can be estimated at 2400, giving a sample size of 240. This sample size is midway between the recommended number of 30 to 500 in behavioural research and as such should yield reasonable results. The writer will however attempt to target all academics in the IOT sector in order to achieve a favourable return and in order to mitigate against selection bias. Similar work on an EU wide basis such as that being carried out by Inno UniLearning (2006), has revealed that it is difficult to identify individuals or even groups charged with lead roles in the integration of ICT into TL&A in higher education institutes. This reinforces the thinking behind targeting 100% of the population for data collection. Krejcie & Morgan (1970) have produced a table for determining sample size. In this table the sample size for the population here of 2400 is 331.

From the management data gathering instrument, all managers both academic and non academic will be invited to complete the survey. The size of the management population is about 240 in the IOTs. The sample size here again if we were to adhere to Alreck & Settle (1995) 10% rule and be 24. This appears a little on the low side. Krejcie and Morgan's (1970) table here would indicate a sample size of 148. However it is intended to target all management staff in the IOT sector in order to achieve an optimum sample size, given expected response rates, here. Time and resources available may also impact on the decision of sample size.

In the development of the survey and the collection of data the researcher is mindful of the constraints of time, cost and inexperience of the researcher. From the time perspective the writer is hoping to target the audience and involve them in a participatory manner. Mukherjee (1995) advises that this method is less time consuming than formal sample survey. Similarly as this is small scale research (not funded, part-time) cost will be kept to a minimum. The writer is optimistic that data gathered from the two tools used and the employment of Marsland et al (2005) multi-level model approach will in some way mitigate against the inexperience of the writer. The writer, although acknowledging that many researchers may not support this approach formally views this approach as lying within the pragmatic view of social research as described by Bryman (1988). That is to say where data from two tools, in this case the LOP and the TLA tools is gathered this may have similar effects to gathering data using different methodologies. The data sources of management survey, academic survey and literature review, in addition to comparative analysis

with work already carried out in this field by for example Inno UniLearning, Educause, The Seuss Report (2003) and Collis & Van der Wende (2002) among others, will assist this process. To establish the trustworthiness of the information as advised by Marsland et al (2005) the study will attempt to adhere to the following points:

- Internal validity or Credibility.
- External validity or Transferability.
- Reliability or Dependability
- Objectivity or Confirm ability

The internal and external validity are underpinned in a number of ways in this study. Internally the selection and development of the tools used are congruous with Bryman (1988 & 2001) exposition of methodologies in survey research. The external validity and transferability will unfold through the analysis phase in Chapter V. Similarly reliability and objectivity can be argued for. Marquardt's LOP tool shows inherent reliability from the actualisation that it has been used in over 500 studies. It also shows impartiality and objectivity in that it is independent of the writer and the context.

Next the TLA tool for gathering data around the level of ICT integration in the subject institutes was developed. Having looked at various models in the literature and having failed to identify one which was suitable for this study a new tool was developed in a similar style to the LOP tool to help provide a consistent user interface for survey participants. The TLA tool comprised of three subsystems covering preparation, delivery and assessment. These subsystems also included questions around learning organization maturity and ICT, where evidence of group-work / collaboration, departmentally, interdepartmentally and inter-organizationally around teaching, learning and assessing were sought. In the TLA tool the first seven statements are related to the level of use of ICT as an individual in each of the subsystems. The last three statements in each of the subsystems relate to the use of ICT in cooperation with others. The statements in the TLA tool were devised by the writer and founded in literature exploration. The TLA tool gathers data around the predictor dependent variables.

Preparation for the launch of the survey was carried out in January 2007. This involved building databases of the names and email contacts of management and

academics staff in the IOT sector in Ireland. The gathering of data to build accurate databases in these areas proved more difficult than was envisaged at the outset. At first the writer attempted to do this as unobtrusively as possible by scanning the web pages of each of the institutes for the relevant contact details. This work bore fruit in the cases of about half of the institutes for the academic cohort and most of the management cohort. Next the writer used known contacts within each of the institutes to try and garner further information on behalf of the academic cohort. This effort bore little or no results because of the lack of availability of email group lists pertaining to academics only being made available. The third stage of this process involved requesting lists of academics from Human Resource (HR) departments. This bore some fruit and the contacts database was built from this data using the various email naming conventions of the subject institutes.

The adapted LOP tool was then loaded onto an online survey instrument called PHPSurveyor. This instrument was chosen from a number of online surveying instruments tested by the writer. This instrument is open source and uses the MYSQL database system as a back end. It catered for all the types of survey questions required by the writer. It had its own mass emailing system built in, for inviting participation, which the writer in the end did not use because of technical difficulties around email security. Another useful feature of PHPSurveyor was that survey data, once gathered, could be easily extracted from the MYSQL database, into a format suitable for spreadsheet or statistical package analysis. This would greatly expedite the preparation of data for analysis. The writer downloaded this open source product from [www.phpsurveyor.org](http://www.phpsurveyor.org) and installed it on a LINUX web server based at Athlone Institute of Technology. To summarize the reasons an online publishing method was chosen were the following:

- Fast delivery of survey to targeted participants
- Easier administration of gathered data
- The predication of limited time and resource of the writer
- It was felt that participants would be more predisposed to completing a survey about the integration of ICT into Teaching Learning and Assessment in this fashion.

Next extensive testing of the LOP and TLA survey tools was carried out by the writer in the initial phase. Then external parties were asked to test the tool, including IT

management staff from two subject institutes, an independent consultant and Professor Jeroen Huisman of the University of Bath. Feedback from the external testers to the online LOP and TLA survey tools in the main was very positive. The changes arising from these tests were to include some small amount of personal detail and covert some positive likert type questions to negative ones throughout the survey as described earlier. The reason for this is that all positives can unduly influence social research data gathering validity. This was also done to avoid response set bias (Messick 1962, Friedman 1988).

The next area to be addressed was the ethical issues around publishing such a survey. The writer chose to email all Registrars in the target higher education institutes as these post holders represent the lead academic managers and the senior authority on research ethics in their organizations. This request proved positive in all but one instance where one IOT declined to partake in the study. Another IOT engaged in interesting debate around ethics in this matter and these deliberations was referred back to the University of Bath, ICHEM, for clarification.

A decision was made to publish the survey in late May 2007. The reasons behind choosing this launch date were:

- Lecturing was complete, in the subject institutes, so it was felt academics might be more predisposed to completing the survey
- Exam entries were being totted, and this usually involves interaction with spreadsheets and computers
- After June academics would be on holiday, and thus unavailable to complete the survey

#### **4.4 Summary**

Chapter IV outlines the methodological approach used in this study. The study can be said to fit idea of deductive theory as described in Bryman and Bell (2007, p 11). Yeo (2002) maintains that this type of approach is commonly used when examining ideas around the learning organization.

*Balancing the possibilities and pitfalls of internet data collection is neither simple nor straightforward. Scholars cannot merely adopt the practices of traditional communication modes, but must approach the*



*internet as a unique medium that necessitates its own conventions.*  
(Best & Krueger, 2004, p 1)

The chapter describes an example of what is now called social eResearch (Anderson & Kanuka 2002, and Paterson et al 2007). The writer was mindful of the caveats identified by Best and Krueger (2004) above. The experience here of using the internet for survey research was interesting and seemed to work reasonably well. This was probably positively influenced by the writer's reasonable technological abilities, which thus enabled him to have full control of the survey development and data gathering processes.

## Chapter V Findings

### 5.1 Introduction

*“The ability to learn faster than your competitors may be the only sustainable competitive advantage”. Arie De Geus (2002, p 51 - 59) .*

In Chapter V issues pertaining to analysing data around the research question, are addressed. The chapter starts with the presentation of the basic descriptive statistics from the data gathered. Here the validity and reliability of the tools used are tested. Then the chapter progresses to the aggregations of scores from both the LOP and TLA tools for both the individual institutes targeted and the IOT sector as a whole. Comparisons are next made between results returned from both cohorts of academics and managers. LOP & TLA scores are then combined for both cohorts. Next subsystem correlations both within and between tools are explored at sector and institute level. Finally results are posited against the research question and sub-questions. This leads to some further explorative regression analyses.

### 5.2 Basic Population Statistics

The mechanism for publishing the survey to both the academic and management cohorts was to do an email merge with the contacts database, which was completed in May 2007. This email contained a request for participation and the appropriate URL link to click on as in the example in appendix III. Each email was personalised in order to encourage higher participation uptake. Microsoft Outlook 2003 was used to generate an email merge for each grouping after names and email details were imported into separate contacts folders for the various higher education institutes and cohorts. Soon after the email launch it became apparent that another institute was unable to participate in the survey due to technical reasons at their end restricting staff from accessing the URL link in the email to the survey tool. At this stage it also emerged that, even after exhaustive efforts, academic contact details could not be ascertained from another institute. So this left the overall survey delivery to subject institutes as per table 4 below.

<i>Institutes</i>	<i>Management</i>	<i>Academic</i>
Total Number in Study	13	13
Responses From	11	12
% Responses From	85%	92%
Total Who replied to Both TLA & LOP	10	10

Table 4: Institute Response Rates.

Each institute was given a fictitious name in order to preserve anonymity. This was requested by the authorities of the institutes involved. These names were sorted alphabetically in order to re-enforce this anonymity. Next all negative statements replies from the survey instrument were converted to positives by subtracting actual score from max scale + 1, to reveal the positive equivalent. As is expected in a survey of this length the question of how to handle not applicable and/or missing answers needed to be addressed. This was handled, by calculating the mean scores for each question based on valid responses only and to replace missing answers with these mean scores. Out of all the individual responses there was less than 13% missing responses. For the valid cases the missing values were replaced with the mean response for that question.

Next the representativeness of the data is addressed. This parameter is best satisfied by making certain that as many sampling locations as possible are included and that sufficient data was gathered. In addition, where practicable, sample variables were tested against population statistics where available. For this purpose the Central Statistics Office ([www.cso.ie](http://www.cso.ie)) and the higher education Authority ([www.heai.ie](http://www.heai.ie)) were contacted. The descriptive statistics sought to establish the representative nature of the data were male/female breakdown, age profile (CSO) and discipline (HEA). These statistics will be referred to as we display sample data results in section 5.3.

The total population of academic staff identified in the 10 institutes equated to approximately 2040. From this number 438 failed to receive an invite to complete the survey. The total number of responses was 316, giving a 20% return rate from those surveyed. Table 6 below indicates an academic response size of 316, which is well in excess of this threshold, ought to provide a meaningful sample for analysis in this study. These numbers are summarised below in Table 5.

<i>Population</i>	<i>Number</i>	<i>Failure</i>	<i>Responses</i>	<i>% Response</i>
Entire	2040	438	316	20%

Table 5: Academic Response Rates.

Out of the academic responses it was decided that those who had completed less than 55% of the survey would be dropped from the analysis. This equated with 15 cases leaving 301 cases for analysis.

The total population of management staff identified in the 10 institutes equated to approximately 210. From this number 22 failed to receive an invite to complete survey. Management responses are depicted in Table 6 below. The writer feels he has sufficient data on the management side to proceed.

<i>Population</i>	<i>Number</i>	<i>Failure</i>	<i>Responses</i>	<i>% Response</i>
Entire	210	22	65	35%

Table 6: Management Response Rates.

Out of the management responses it was decided that those who had completed less than 55% of the survey would be dropped from the analysis. This equated with 0 cases leaving 65 cases for analysis. Out of all the individual management responses there was less than 2% missing responses. For these 65 cases the missing values were replaced with the mean response for that question.

The learning organizational profile score was then calculated for each institute in the survey by taking the average score of each set of respondents (management, academic staff) for each IOT. This tool establishes the learning organization profile score based on five sub-systems: Learning Dynamics, Organization Transformation, People Empowerment, Knowledge Management and Technology Application. Each sub-system of the tool presents ten statements around the title subject, which require 'likert' scale type responses. The maximum score obtainable is 200 (5 sub-systems x 10 questions x 4 = highest score), the minimum score would be 50 (5 sub-systems x 10 questions x 1 = lowest score).

### 5.3 Management LOP Descriptive Statistics

The first descriptive statistic looked at from the data gathered, using Marquardt's (2002) adapted LOP tool, was the learning organization profile score from a

management perspective for each subject institute. The maximum score achievable is 200. The resultant scores are displayed in Figure 13 below.

The results here indicate that there is some variance across the sector in how management view their institutes in relation to learning organization maturity. This is summarized in the table 7 below (individual respondents' scores). The mean LOP score for all respondents to the management survey was 135.76. The level of scores here would also indicate that management in the Heaney & Swift Institutes indicate the most significant levels of learning organization maturity.

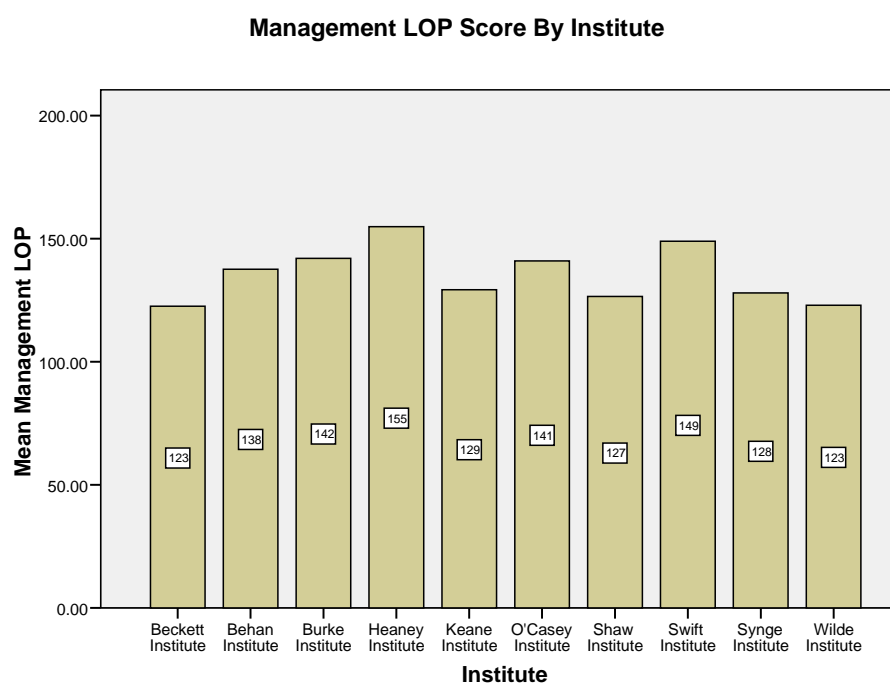


Figure 13: Management LOP by Institute.

	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Variance</i>
Management LOP	65	95	185	135.77	19.81	392.62
Valid N (listwise)	65					

Table 7 : Management LOP Mean Score.

Table 8 represents a reliability test on all the individual management LOP scale answers. This result here is .928 which exceeds the .7 threshold generally accepted in social science research.

<i>Reliability Statistics</i>	
<i>Cronbach's Alpha</i>	<i>N of Items</i>
0.928	50.00

Table 8: Lop Tool Reliability Test.

Data was gathered from different management categories within the subject institutes. These results are reflected at sector level in Figure 14 below. Overall it is interesting to note that non-academic managers view their institutes as leaning slightly more towards learning organization maturity than their academic management peers across the sector. This graph also indicates that senior management return higher LOP scores than middle management.

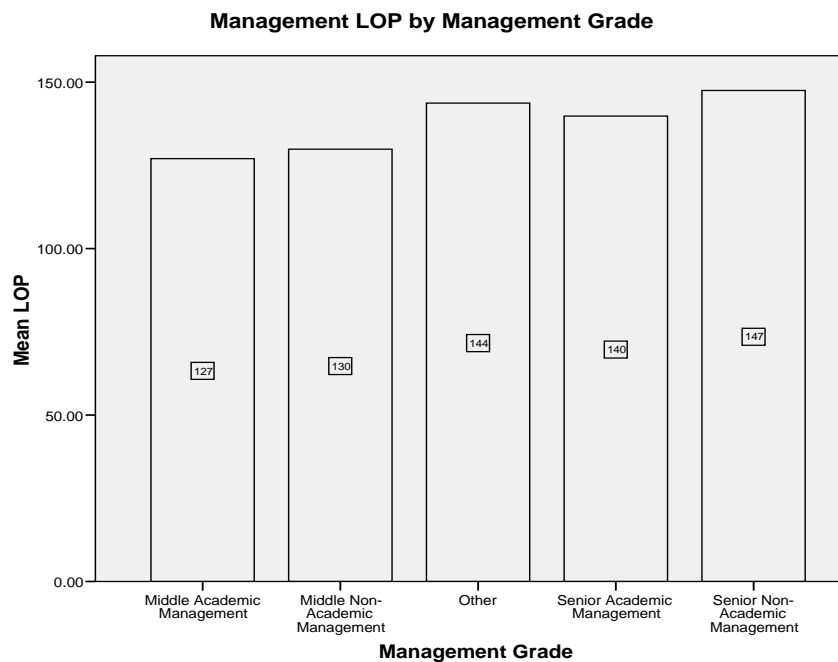


Figure 14: Management Lop By Management Grade.

	<i>Management Age Group</i>					<i>Total</i>
	<i>&lt;= 30</i>	<i>31 – 40</i>	<i>41 -50</i>	<i>51 - 60</i>	<i>&gt; 60</i>	
Beckett Institute	0	0	4	1	0	5
Behan Institute	0	1	4	1	0	6
Burke Institute	0	3	1	1	0	5
Heaney Institute	0	3	2	2	1	8
Keane Institute	0	0	2	1	0	3
O'Casey Institute	0	3	2	3	1	9
Shaw Institute	0	5	4	2	0	11
Swift Institute	0	1	2	1	0	4
Synge Institute	0	1	0	2	0	3
Wilde Institute	0	1	1	1	0	3
<b>Total</b>	0	18	22	15	2	57

Table 9 : Management by Age Group.

	<i>Management Age Group</i>					<i>Total</i>
	<i>&lt;= 30</i>	<i>31 – 40</i>	<i>41 -50</i>	<i>51 – 60</i>	<i>&gt; 60</i>	
CSO POPULATION STATISTIC	842	3357	3247	2479	1048	10973
CSO POPULATION STATISTIC %	8%	31%	30%	23%	10%	100%
STUDY MANAGEMENT SAMPLE	0	18	22	15	2	57
STUDY MANAGEMENT SAMPLE %	0%	32%	39%	26%	4%	100%

Table 10 : Management Age Profile Against Population.

Table 9 indicates that there is reasonably young management cohort in the IOT sector, with a normal looking distribution across age groups. Table 10 compares study data with that of the 2006 population census in the category of university and IOT teachers. Save for the under 30 aberration, which could be indicative of small teacher schools where the first appointed teacher is also the principal there is a reasonable fit across the other bands with the population statistic, bearing in mind that the group of managers that responded was relatively small. The inequity in the over 60 category may indicate a bias towards younger more computer literate managers completing an online survey. Overall it is fair to assume that this sample is reasonable representative.

### Management Staff

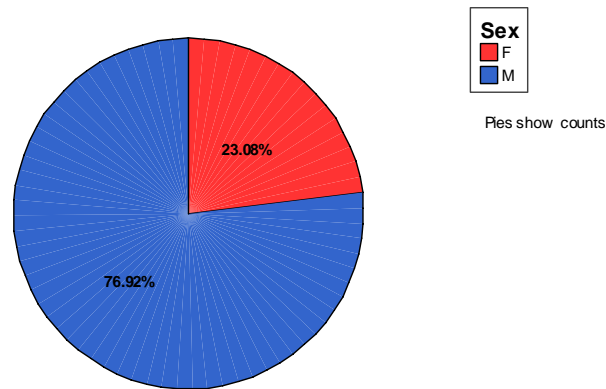


Figure 15 : Management Male/Female Breakdown.

Table 11 below, and figure 15. above, indicates the male/female makeup among the management staff sample taken from the subject institutes. This is compared with 2006 higher education teacher population statistic and the 2006 senior managers in local government population statistic. Managers in IOTs can be regarded as senior managers in local government given their pay and conditions of employment. This sample is then reasonably representative of the population as a whole under this parameter.

Sex			
		Frequency	Percent
Study Sample	F	15	23%
	M	50	77%
CSO Population Statistic (Teachers in higher education)	F	4694	43%
	M	6279	57%
CSO Population Statistic (Senior Managers in Local Government)	F	205	26%
	M	570	74%

Table 11 : Management Sex Breakdown Against the Population.

Next in Table 12 the institute mean scores for each sub-system of the learning organization profile from a management perspective is presented. Remember here that the maximum score for each subsystem is 40 (10 questions x 4 = highest score). Most of the scores here are based in the twenties. The Swift Institute shows a high mean LOP score in the people empowerment subsystem, while the Wilde Institute reveals the lowest mean LOP score of 23.25 in learning dynamic subsystem.



	<i>Learning</i>	<i>Organization</i>	<i>People</i>	<i>Knowledge</i>	<i>Technology</i>
<i>Institute</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>
Beckett Institute	24.40	23.60	25.80	24.00	24.80
Behan Institute	26.29	27.43	27.57	27.14	29.14
Burke Institute	25.50	27.50	29.33	28.83	30.83
Heaney Institute	30.38	30.13	31.75	30.13	32.50
Keane Institute	25.75	25.50	25.25	24.00	28.75
O'Casey Institute	26.44	26.22	28.00	27.22	33.11
Shaw Institute	23.93	24.71	26.07	23.79	28.07
Swift Institute	25.50	31.75	32.00	28.75	31.00
Synge Institute	23.50	24.75	27.00	24.50	28.25
Wilde Institute	23.25	24.00	23.75	23.50	28.50

Table 12 : LOP Subsystems Mean Score by Institute.

In the IOT sector overall, it was found that female managers returned a mean LOP score of 140.33 while male managers returned a score of 134.40. This data is in keeping with findings by Hoyer & Macinnis (1997), where they identified variations in male and female attitudes in relation to learning organization maturity.

	<i>Learning</i>	<i>Organization</i>	<i>People</i>	<i>Knowledge</i>	<i>Technology</i>
<i>Source</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>
Study	25.65	26.49	27.71	26.23	29.69
Marquardt 500	23.20	22.40	21.80	21.60	20.70
Ohio State University 1999	33.66	33.21	31.50	31.34	30.05

Table 13 : Management Mean LOP Score vs Other Empirical Data.

Table 13 shows a comparison of the management study with Marquardt's mean score from over 500 organizations during the nineties for each of the 5 subsystem. There is quite a significant difference here. Marquardt's results are from the business world and do not include higher education. Marquardt canvassed both management and staff. One reason for the difference in scores may be that Marquardt's data was gathered some years ago and at that time the idea of learning organization maturity may not have been accepted as it may be at the time of this study. This may explain some of the differences. This table also includes comparison with an example found in higher education from the OHIO State University in 1999.

#### 5.4 Academic Staff LOP Descriptive Statistics.

Figure 16 below shows the LOP score by institute from an academic perspective. The results here indicate that there is some small variance across the sector in how academics score their institutes in relation to learning organization maturity. This is summarized in the table 14 below. The level of scores here would also indicate that

none of these organizations could be said to be fully engaged as learning organizations in the eyes of their academic staff.

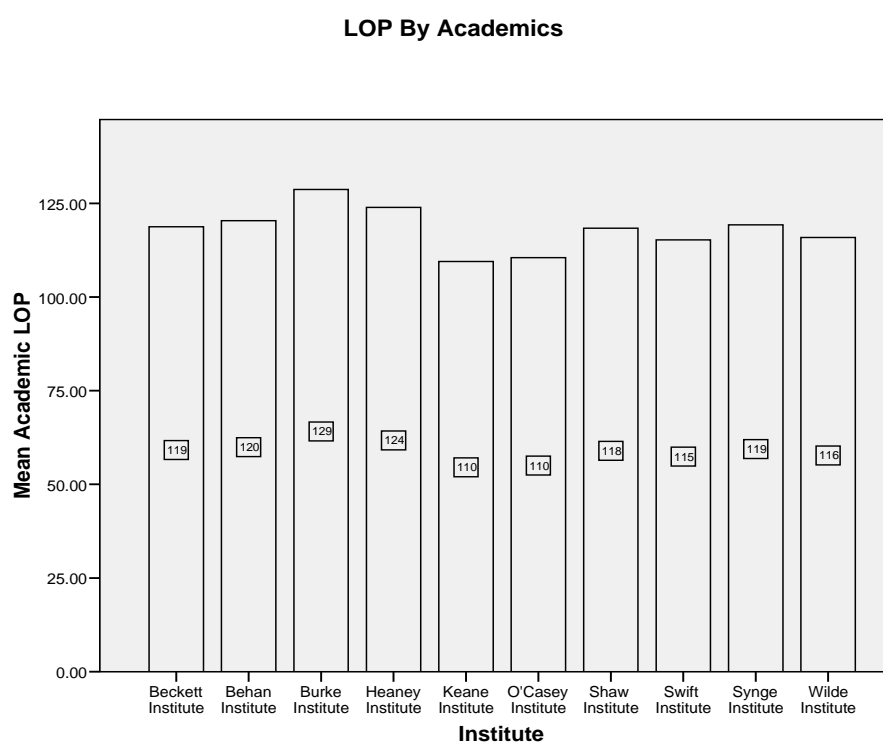


Figure 16 : LOP Score By Academic Cohort By Institute.

<i>Academic LOP</i>		
N	Valid	301
	Missing	0
Mean		118.36
Std. Deviation		19.99
Variance		399.69
Minimum		71
Maximum		169

Table 14 : LOP Score By Academic Cohort.

Table 15 represents a reliability test on the individual academic LOP scores returned. The .93 here is above the .7 threshold generally accepted in social science research.

<i>Reliability Statistics</i>	
<i>Cronbach's Alpha</i>	<i>N of Items</i>
0.930	50.00

Table 15 : Academic LOP Reliability Test.

In Table 16 we look at LOP scores by academic discipline across the sector. What is interesting to note here is that Arts & Humanities academics show the highest average score while Business academics return the lowest.

		<i>Academic LOP</i>
		Mean
DISCIPLINE	Art & Humanities	122.08
	Business	115.32
	Engineering	116.92
	Other	117.48
	Science	119.33
	Social Studies	119.40

Table 16 : Academic LOP By Discipline.

In the IOT sector overall, it was found that female academics have a mean LOP score of 119.73 while male academics show a score of 117.36. This result, again, is in keeping with findings by Hoyer & Macinnis (1997), where they identified variations in male and female attitudes in relation to learning organization maturity. Table 17 displays the academic respondents by their age group. 32 respondents did not give their age. The results indicate a reasonable age profile across the IOT sector among academics.

<b>Age Group</b>	<b>&lt;= 30</b>	<b>51 – 60</b>	<b>31 – 40</b>	<b>41 – 50</b>	<b>&gt; 60</b>	<b>Total</b>
	<i>Count</i>	<i>Count</i>	<i>Count</i>	<i>Count</i>	<i>Count</i>	<i>Count</i>
Beckett Institute	1	2	4	16	0	23
Behan Institute	0	1	14	6	1	22
Burke Institute	2	1	5	1	0	9
Heaney Institute	5	8	12	16	1	42
Keane Institute	2	3	7	9	0	21
O'Casey Institute	1	2	9	7	0	19
Shaw Institute	3	10	21	19	4	57
Swift Institute	1	2	5	5	0	13
Synge Institute	3	8	10	14	0	35
Wilde Institute	0	9	6	13	0	28
<b>Total</b>	18	46	93	106	6	269

Table 17: Academic Cohort Age Breakdown.

Table 18 compares the academic age group data with that of the 2006 population census in the category of university and IOTs teachers. Our sample, when compared

to the population statistic for teachers in higher education is weighted more to the 40 to 60 age group rather than the 30 to 40 age group of the population statistic

	Academic Age Group					Total
	< = 30	31 – 40	41 -50	51 - 60	> 60	
CSO POPULATION STATISTIC	842	3357	3247	2479	1048	10973
CSO POPULATION STATISTIC %	8%	31%	30%	23%	10%	100%
STUDY ACADEMIC SAMPLE	18	46	93	106	6	269
STUDY ACADEMIC SAMPLE %	7%	17%	35%	39%	2%	100%

Table 18: Academic Age Profile Against Population..

#### Academic Staff

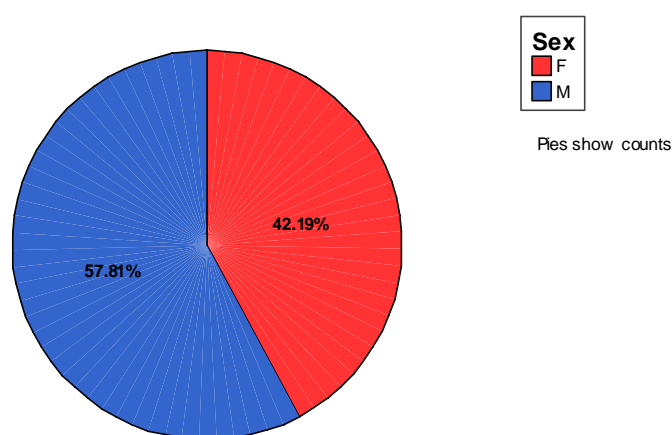


Figure 17 : Academic Staff Male / Female Breakdown.

Figure 17 indicates the breakdown by sex among academic staff. This indicates a 58 / 42 % male / female division among academics, in comparison with graph 3 which indicates a 77 / 23 % male / female division among management staff.

Sex			
		Frequency	Percent
Study Sample	F	127	42%
	M	174	58%
CSO Population Statistic (Teachers in higher education)	F	4694	43%
	M	6279	57%

Table 19 : Academic Sex Breakdown against the Population .

Table 19 above, indicates the male/female makeup among the academic staff sample taken from the IOT sector. This is compared with CSO 2006 higher education

teacher population statistic. This sample is representative of the population as a whole under this parameter.

Next in Table 20 we look at the institute mean scores for each subsystem of the learning organization profile tool from an academic perspective. Remember here that the maximum score for each subsystem is 40. Most scores here centre on the early to mid twenties. The Burke Institute shows a high mean LOP score in the people empowerment and technology application subsystems, while the O'Casey Institute reveals a low mean LOP score for the organizational learning subsystem.

	<i>Learning</i>	<i>Organization</i>	<i>People</i>	<i>Knowledge</i>	<i>Technology</i>
	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>
Beckett Institute	22.38	22.67	23.96	23.67	26.08
Behan Institute	24.23	23.82	24.50	22.55	25.27
Burke Institute	24.00	25.85	27.15	24.77	26.92
Heaney Institute	24.24	24.36	25.22	24.44	25.64
Keane Institute	21.55	20.86	22.59	20.68	23.82
O'Casey Institute	21.70	20.20	21.60	22.00	25.00
Shaw Institute	23.18	22.72	23.51	23.86	25.08
Swift Institute	22.75	23.44	23.13	21.56	24.38
Synge Institute	24.24	23.74	22.97	23.42	24.92
Wilde Institute	22.14	22.62	22.86	23.24	25.03

Table 20 : Academic LOP subsystem scores by Institute.

	<i>Learning</i>	<i>Organization</i>	<i>People</i>	<i>Knowledge</i>	<i>Technology</i>
<i>Source</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>
Study	23.18	23.03	23.69	23.28	25.18
Marquardt 500	23.20	22.40	21.80	21.60	20.70
Ohio State University 1999	33.66	33.21	31.50	31.34	30.05

Table 21 : Academic Mean LOP Score vs Other Empirical Studies.

Table 21 displays a comparison of the academic results with Marquardt's mean score gathered from over 500 organizations, and the Ohio State University results for each of the 5 subsystem. There is some similarity in the first two subsystems. Marquardt's results are from the business world and do not include higher education. Marquardt's data was gathered some years ago and at that time the idea of a learning organization may not been as accepted as it is at the time of this study. The Ohio University results are higher across all subsystems.

The next area of data to be described was the academics' response to the level of use of ICT in teaching, learning and assessing, which was gathered via the TLA tool. All negative statements replies to the TLA survey tool were again converted to

positives as described earlier. Scores here were calculated in a similar fashion to Marquardt's LOP with a maximum achievable score of 120. Non-applicable / missing answers were replaced with mean scores for each question based on valid responses only. Next the results from the TLA survey tool are described.

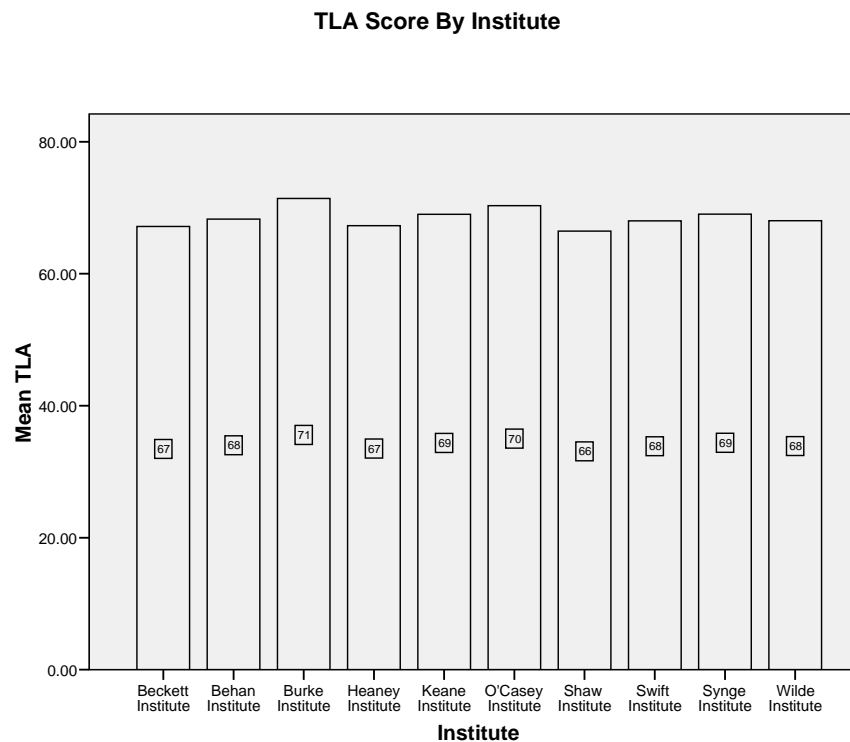


Figure 18 : TLA Score by Institute .

	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Variance</i>
TLA	301	41	99	67.98	10.42	108.48
Valid N (listwise)	301					

Table 22 : Mean TLA Score.

Table 22 and figure 18 above, describe the closeness of the scores across the Institutes as indicated by the small variance and standard deviation. The maximum score returnable is 120 (3 sub-scales x 10 questions x 4 = highest score), the minimum score is 30 (3 sub-scales x 10 questions x 1 = lowest score). Table 23 looks at the mean score across the institutes for each of the subsystems around preparation, delivery and assessment. The maximum score here in each subsystem here is 40 (10 questions x 4 = highest score).

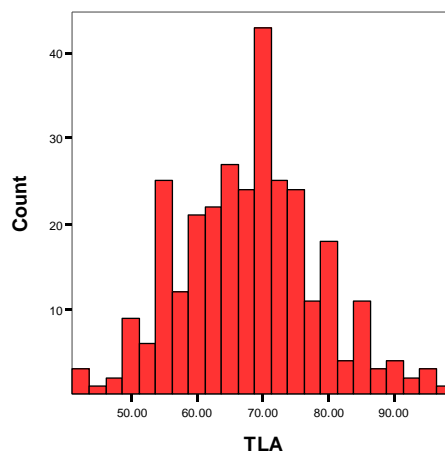


Figure 19 : TLA Distribution Histogram.

Figure 19 is a histogram showing the distribution of TLA scores for academics across the sectors. When compared with Roger's diffusion of innovation bell graph synergies can be extrapolated where the main body of scores lie in the early – late majority area, if the proposition is offered that this is analogous to mainstream use of ICT by the academics in the study.

	<i>Preparation</i>	<i>Delivery</i>	<i>Assessment</i>
	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>
Beckett Institute	23.83	21.46	21.88
Behan Institute	24.77	22.45	21.05
Burke Institute	26.38	23.77	21.23
Heaney Institute	24.96	22.18	20.16
Keane Institute	24.95	23.32	20.73
O'Casey Institute	26.30	22.05	21.95
Shaw Institute	25.35	21.86	19.24
Swift Institute	25.31	22.38	20.31
Synge Institute	24.95	22.05	22.03
Wilde Institute	24.93	21.97	21.14

Table 23 : TLA Subsystems Score by Institute.

What is noticeable in table 23 at first glance is the decline in score from left to right across this table, which may indicate that ICT is engaged with at the highest level in preparation of lectures and least with in assessment. As a first look at reliability we can compare the overall mean TLA score with the technology subsystems both of the current study and Marquardt 500 score. The reason for this is that the technology subsystem is another measure indicative of the uptake and integration of technology in an organization. The results of this comparison are displayed in the Table 24 below. The TLA score is adjusted to the same base as the other scores. The score

appears closer to Marquardt's 500 measure, than the results from similar variables in LOP tool for the current study.

<i>TLA Score</i>	<i>Management Technology</i>	<i>Academic Technology</i>	<i>Marquardt 500 Technology</i>
<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>
22.66	29.69	25.18	20.70
57%	74%	63%	52%

Table 24 : Mean TLA vs LOP Technology Subsystems Scores.

Table 25 looks to see if there is any correlation between the subsystem TLA scores. Correlation here supports the aggregation and reliability of the overall TLA score.

<i>Correlations</i>		<i>Preparation</i>	<i>Delivery</i>	<i>Assessment</i>
Preparation	Pearson Correlation	1.00	**0.59	**0.42
	Sig. (2-tailed)		0.00	0.00
	N	301.00	301.00	301.00
Delivery	Pearson Correlation	**0.59	1.00	**0.50
	Sig. (2-tailed)	0.00		0.00
	N	301.00	301.00	301.00
Assessment	Pearson Correlation	**0.42	**0.50	1.00
	Sig. (2-tailed)	0.00	0.00	
	N	301	301	301
** Correlation is significant at the 0.01 level (2-tailed).				

Table 25 : TLA Subsystems Correlation Analysis.

Table 26 represents a reliability test on all the individual TLA scale answers. The .78 result here is above the .7 threshold which is generally accepted in social science research. This result also compares favourably with the LOP result. Table 27 uses the Strict Parallel Model to also look at scale reliability. This table also indicates satisfactory results.

<i>Reliability Statistics</i>		
	<i>Cronbach's Alpha</i>	<i>N of Items</i>
TLA	0.78	30.00
LOP	0.93	50.00

Table 26 : TLA Reliability Test.

<i>Reliability Statistics</i>	
TLA (Strict Parallel Model)	0.663
LOP (Strict Parallel Model)	0.883

Table 27 : TLA Reliability Test – Parallel Model.



		Coefficients(a)				
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	73.43	3.17		23.13	0.00
	Age	-0.13	0.07	-0.11	-1.73	0.08
	Dependent Variable:					
a	TLA					

Table 28 : Age vs TLA Predictor Test.

Table 28 looks to see if age has a predictor effect on TLA score for all respondents. No significance is shown here.

Tables 29 & 30 describe the TLA Score and subsystem breakdown by subject discipline for academics in the sector. Engineering which displays the lowest score here is perhaps a little surprising. However in general there is little variance across this range of data. Comparative data was sought from the Higher Education Authority (HEA) in Ireland for representativeness tests on discipline, but these statistics were not available at the time of this study.

		Preparation	Delivery	Assessment	TLA
		Mean	Mean	Mean	Mean
DISCIPLINE	Art & Humanities	24.61	22.27	20.20	67.08
	Business	24.83	22.65	20.75	68.22
	Engineering	24.94	21.07	20.45	66.46
	Other	25.59	22.44	20.48	68.52
	Science	25.70	22.64	21.75	70.09
	Social Studies	26.40	22.90	18.90	68.20

Table 29 : TLA Subsystems By Discipline.

Descriptive Statistics						
	N	Minimum	Maximum	Mean	Std. Deviation	Variance
TLA	301.00	41.00	99.00	67.98	10.42	108.48
Valid N (listwise)	301.00					

Table 30 : TLA Descriptive Statistics.

The analysis next set out to find similar research for validity and comparative studies around academic adoption of ICT in higher education. In the main the focus in most other empirical work in this domain is on ICT usage by students rather than academics. While research and reports such as Seusiss (EU, 2003), BECTA (UK, 2003) and the European ECompetence Initiative (EU, ongoing), refer to phenomena such as 'digital literacy', 'ICT literacy' and 'eCompetence', they had not at the time of

this study yet produced statistics on which to make comparable analysis for academics. The European Commission sponsored 2006 Empirica Report 'Benchmarking Access & Use of ICT in European Schools', will be used for some comparative and reliability analysis against the TLA results. This report has data for 25 EU states.

<i>Empirical Comparison</i>	
Preparation	76.00%
Empirica (Ireland)	77.80%
Delivery	65.28%
Empirica (Ireland)	58.30%

Table 31 : TLA Subsystems vs Empirical Studies.

Table 31 above compares the mean preparation & delivery findings of this study with the Empirica (2006) data. These comparisons were taken from the first six questions in both the preparation and delivery subsystems of the TLA tool. These subsystems equate with a measure of straight forward use of ICT in these areas as does the Empirica report. No Empirica data existed for comparison with the results from the assessment subsystem of the TLA tool.

<i>TLA &amp; Global Faculty 2007 E-Book Survey Level of Computer Literacy</i>					
		<i>Art &amp; Humanities</i>	<i>Soc / Business</i>	<i>Science / Engineering</i>	<i>Other</i>
		<i>Count</i>	<i>Count</i>	<i>Count</i>	<i>Count</i>
TLA	Poor	0%	0%	0%	0%
	Good	20%	22%	38%	8%
	V Good	0%	4%	7%	1%
E-Book	Poor	0%	0%	0%	0%
	Good	15%	22%	14%	2%
	V Good	11%	23%	12%	2%

Table 32 : TLA vs Global Ebook.

Table 32 compares TLA results to a recent (2007) international study by Ebrary. The categorizing of discipline as a comparative is not 100% clear here. The main finding here is that all categories in both studies across discipline view their computer literacy either as good or very good.

	<i>LOP</i>	<i>Learning</i>	<i>Organization</i>	<i>People</i>	<i>Knowledge</i>	<i>Technology</i>
	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>
Marquardt 500	109.70	23.20	22.40	21.80	21.60	20.70
Ohio State University 1999 Combined Management + Academics	159.76	33.66	33.21	31.50	31.34	30.05
Academics	121.45	23.62	23.64	24.40	23.81	25.98
Academics	118.36	23.18	23.03	23.69	23.28	25.18
Management	135.77	25.65	26.49	27.71	26.23	29.69

Table 33 : LOP Subsystems vs Empirical Studies.

Finally in this section Table 33 provides a comparison between LOP subsystem and LOP mean scores of the study with Marquardt's 500 (mainly based on businesses during the nineties) results and the higher education study carried out in 1999 in Ohio State University. Here we can see quite a similarity between the learning dynamic subsystems score between Marquardt's results and those of the IOT sector in Ireland. The largest divergence here is in the technology application sector. The reason for this may in part be temporal given that Marquardt's data was gathered in the nineties where the use of technology application is likely to be less than one would expect to find given the greater rates of diffusion at the time of study. The second largest divergence in subsystems is that of people empowerment. Again this may in part be indicative of greater autonomy and freedom allowed to academics in their profession in comparison with that afforded staff employed in the business world.

## 5.5 Individual Institute Extended Analysis

The main reason why the LOP instrument was chosen, for this study, was to allow for the aggregation of data from the individual to the organizational level. The justification for this approach is that this is how the LOP instrument was applied in about 500 cases studies on private organizations by Marquardt and others to capture a measure of learning organization maturity in these organizations. The same pragmatism is applied to the TLA tool here, given its similar origins. The Learning Organization Profile tool uses likert scale questionnaire to gather data. There are many arguments and counter arguments e.g. Kent (2001), Clason & Dormody (1994), Mendenhall (1986) in the literature about whether this data may be considered quantitative as assumed in section 5.2., 5.3 and 5.4, or is it strictly ordinal for the purposes of statistical analysis. The methodology that will be followed here is to examine this data as ordinal first, to see if it is feasible to analyse it as scale data. The first question to arise with the data is to consider its reliability, and thus suitability

to be analysed as scale as well as ordinal data. To do this, Cronbach's Alpha test for reliability was applied to the data gathered from each subject institute. This test was applied to the entire data set earlier with positive results. Here the focus is on the individual data sets from the ten subject institutes from both the LOP and TLA tools for all respondents. This test was applied to both the learning organization profile subsystems and then the teaching, learning and assessing subsystems.

	<i>LOP Academics</i>	<i>LOP Management</i>	<i>Combined LOP</i>	<i>TLA</i>
Beckett Institute	0.934	0.532	0.924	0.850
Behan Institute	0.912	0.951	0.935	0.853
Burke Institute	0.930	0.903	0.930	0.453
Heaney Institute	0.944	0.879	0.951	0.827
Keane Institute	0.946	0.887	0.942	0.805
O'Casey Institute	0.876	0.951	0.944	0.712
Shaw Institute	0.905	0.905	0.910	0.783
Swift Institute	0.934	0.866	0.945	0.603
Synge Institute	0.938	0.908	0.936	0.582
Wilde Institute	0.937	0.900	0.934	0.840

Table 34 : LOP Subsystems Alpha by Institute.

Table 34 indicates that the LOP and TLA Cronbach's Alpha results for subject institutes, in most cases, are above the .7 threshold generally accepted in social science research. From these results and given the resource limitations of this research it is reasonable to view data returned for the purpose of analysis as scale data.

Some tables from herein apply to individual subject institutes while others apply to the IOT sector as a whole. In analysing the data accumulated from the individual subject institutes, involved in this cross-sectional study, the writer decided to compute scores for the subsystems, in line with the grouping delineation of both Marquardt's LOP tool and the writer's own TLA tool. Bryman (2001) also referred to the use of subscales in this manner. The reasoning for this was to allow for more manageable tables for presenting the data for comparative analysis. Under the LOP umbrella the subsystems are called Learning, Organization, People, Knowledge and Technology. The sum of these subsystems were also computed to give the overall LOP score. In the TLA tool the subsystems are called Preparation, Delivery and Assessment. The sum of these subsystems are computed to give the overall TLA score. This study will test this data set against the research question using in the main independent sample, correlation and multivariate analysis.

First off the study will ascertain whether the academic management breakdown produces significantly different views of learning organization maturity. These tests are important if the study is to combine management and academic staff LOP scores for correlation tests later with TLA scores. The writer also proposes that combining the management and academic scores will give us a more balanced over all LOP score for each subject institute and the sector as a whole. The reasoning here being that managers may have a slightly over optimistic view, while academics may have a slightly over pessimistic view of the learning organization maturity of their own organizations. The independent sample test for the different subsets of the LOP tool against the staff category grouping for the IOT sector as a whole, are show in tables 35 and 36 below.

	<i>S_Cat_Code</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>
LOP	Academics	301	118.359	19.992	1.152
	Management	65	135.769	19.815	2.458

Table 35 : LOP By Cohort Means.

<i>Independent Samples Test</i>				
			LOP	
			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		0.011	
	Sig.		0.916	
t-test for Equality of Means	T		-6.377	-6.414
	Df		364.000	94.260
	Sig. (2-tailed)		0.000	0.000
	Mean Difference		-17.410	-17.410
	Std. Error Difference		2.730	2.714
	95% Confidence Interval of the Difference	Lower	-22.779	-22.800
		Upper	-12.042	-12.021

Table 36 : LOP by Cohort T-Test.

These results indicate that there was significant difference in LOP scores between academics and management,  $t(364) = 6.38$ ,  $p = .00$ . That is, the average LOP score of academics ( $M = 118.36$ ,  $SD = 19.99$ ) was significantly different from that of management ( $M = 135.77$ ,  $SD = 19.82$ ). Marquardt canvassed both management and staff to come up with his 500 mean scores.

The next phase in the analysis of the findings is based on the combined academic and management LOP scores as this equates, as the writer reasoned above, with a

more complete estimate of learning organization maturity of the subject institutes. In Table 37 the combined (academic and management) LOP scores of individual institutes are compared with the IOT sector average combined LOP of 121.45. In all but one case i.e. that of the Burke Institute the  $p$  values produced is greater than the level of significance  $p = .05$ . As is expected both positive and negative  $t$  scores appear in this table. Thus we conclude that only the Burke Institute LOP score shows any significant difference from the sector LOP average of 121.45.

LOP	One-Sample Test					
	Test Value = 121.45	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
	T				Lower	Upper
Beckett Institute	-0.596	28	0.556	-2.036	-9.036	4.963
Behan Institute	0.890	28	0.381	3.067	-3.991	10.126
Burke Institute	2.598	18	0.018	11.445	2.189	20.700
Heaney Institute	2.138	52	0.037	7.135	0.437	13.833
Keane Institute	-2.002	25	0.056	-8.912	-18.080	0.257
O'Casey Institute	-0.347	28	0.731	-1.484	-10.244	7.275
Shaw Institute	-0.905	85	0.368	-1.752	-5.603	2.098
Swift Institute	0.110	19	0.913	0.550	-9.869	10.969
Synge Institute	-0.411	41	0.683	-1.331	-7.874	5.212
Wilde Institute	-1.320	32	0.196	-4.692	-11.935	2.551

Table 37 : Institute LOP vs Sector LOP.

TLA	One-Sample Test					
	Test Value = 67.98	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
	T				Lower	Upper
Beckett Institute	-0.306	23.000	0.762	-0.813	-6.310	4.683
Behan Institute	0.114	21.000	0.910	0.293	-5.033	5.619
Burke Institute	1.789	12.000	0.099	3.405	-0.742	7.551
Heaney Institute	-0.405	44.000	0.688	-0.691	-4.131	2.749
Keane Institute	0.428	21.000	0.673	1.020	-3.932	5.972
O'Casey Institute	1.064	19.000	0.301	2.320	-2.246	6.886
Shaw Institute	-1.296	71.000	0.199	-1.536	-3.898	0.827
Swift Institute	0.010	15.000	0.992	0.020	-4.230	4.270
Synge Institute	0.866	37.000	0.392	1.046	-1.401	3.494
Wilde Institute	0.024	28.000	0.981	0.054	-4.571	4.680

Table 38 : Institute TLA vs Sector TLA.

In Table 38 the TLA scores of individual institutes are compared with the IOT sector average TLA of 67.98. In all cases the  $p$  values produced are greater than the level of significance  $p = .05$ . As is expected both positive and negative  $t$  scores appear in

this table. Thus there is no evidence to conclude that individual institutes TLA scores are significantly different than the sector TLA average of 67.98.

In Table 39 the academic discipline LOP scores are compared with the IOT sector average academic LOP score of 118.36. In all cases the  $p$  values produced are greater than the level of significance  $p = .05$ . Thus there is no evidence to conclude that academic discipline LOP scores are significantly different than the sector academic LOP average of 118.36.

Discipline LOP	One-Sample Test					
	Test Value = 118.36		Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
	<i>t</i>	<i>df</i>			Lower	Upper
ART	1.495	65.000	0.140	3.716	-1.248	8.679
BUSINESS	-1.342	62.000	0.184	-3.043	-7.574	1.489
ENGINEERING	-0.650	70.000	0.518	-1.445	-5.880	2.991
OTHER	-0.186	26.000	0.854	-0.879	-10.584	8.827
SCIENCE	0.386	63.000	0.701	0.968	-4.047	5.983
SOCIAL SCIENCE	0.128	9.000	0.901	1.040	-17.391	19.471

Table 39 : Discipline LOP vs Mean LOP.

In the next phase of analysis the study seeks to ascertain which features of LOP, if any have a significant affect on the integration of ICT into TLA.

	LOP	Learning	Organization	People	Knowledge	Technology
Keane Institute	113	22	22	23	21	25
Wilde Institute	117	22	23	23	23	25
Beckett Institute	119	23	23	24	24	26
Shaw Institute	120	23	23	24	24	26
O'Casey Institute	120	23	22	24	24	28
Synge Institute	120	24	24	23	24	25
Swift Institute	122	23	25	25	23	26
Behan Institute	125	25	25	25	24	26
Heaney Institute	129	25	25	26	25	27
Burke Institute	133	24	26	28	26	28

Table 40 : Combined LOP Subsystems Scores by Institute.

Table 40 displays the combined LOP score amongst the institutes for management and academics. The increase in scores in this table is also uniformly consistent across the subsystems. The differences among the subsystems between Burke and Keane are between 2 and 5.

Table 41 looks at the TLA and TLA subsystem scores in the individual institutes. The increase in scores in this table is not quite as uniformly consistent across the subsystems as with the LOP scores. The differences among the subsystems between Burke and Shaw are between 1 and 2.

	<i>TLA</i>	<i>Preparation</i>	<i>Delivery</i>	<i>Assessment</i>
Shaw Institute	66	25	22	19
Beckett Institute	67	24	21	22
Heaney Institute	67	25	22	20
Swift Institute	68	25	22	20
Wilde Institute	68	25	22	21
Behan Institute	68	25	22	21
Keane Institute	69	25	23	21
Synge Institute	69	25	22	22
O'Casey Institute	70	26	22	22
Burke Institute	71	26	24	21

Table 41 : TLA Subsystems Scores Ranking by Institute.

<i>LOP Rank</i>		<i>TLA Rank</i>
1	Burke Institute	1
2	Heaney Institute	8
3	Behan Institute	5
4	Swift Institute	7
5	Synge Institute	3
6	O'Casey Institute	2
7	Shaw Institute	10
8	Beckett Institute	9
9	Wilde Institute	6
10	Keane Institute	4

Table 42 : TLA vs LOP Ranking by Institute.

Table 42 looks at the rank of each Institute as it scored against both tools. Burke, Behan, Synge and Beckett are ranked reasonably close in both.

<i>Independent Samples Test</i>			
		<i>TLA</i>	
		Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F	3.233	
	Sig.	0.076	
t-test for Equality of Means	T	1.698	2.204
	Df	83.000	22.531
	Sig. (2-tailed)	0.093	0.038
	Mean Difference	4.940	4.940
	Std. Error Difference	2.910	2.242
	95% Confidence Interval of the Difference	Lower	0.297
		Upper	9.583

Table 43 : Best vs Worst Institute TLA Score.



The results in Table 43 which compares the TLA mean of Burke (best case) and Shaw (worst case) indicate that there was no significant difference in TLA scores between Burke and Shaw,  $t(83) = 1.698$ ,  $p = .093$ . That is, the TLA score of Burke ( $M = 71$ ,  $SD = 6.86$ ) was not significantly different from that of Shaw ( $M = 66$ ,  $SD = 10.05$ ).

<i>Correlations</i>			
		<i>LOP</i>	<i>TLA</i>
LOP	Pearson Correlation	1.000	0.401
	Sig. (2-tailed)		0.000
	N	366.000	301.000
TLA	Pearson Correlation	0.401	1.000
	Sig. (2-tailed)	0.000	
	N	301	301

Table 44 : LOP V TLA Correlation Analysis.

From table 44 a moderate positive and significant relationship between LOP and TLA scores ( $r = .401$ ,  $p = .000$ ) is established at the sector level. This implies that in the IOT sector the degree of learning organization maturity has a positive correlative relationship with the level of integration of ICT into teaching, learning and accessing. Next the focus is on the best and worst institute cases from the LOP & TLA score perspectives to establish if the overall relationship carried through at the institute level.

<i>Correlations Burke Best Case</i>			
		<i>LOP</i>	<i>TLA</i>
LOP	Pearson Correlation	1.000	0.295
	Sig. (2-tailed)		0.327
	N	19.000	13.000
TLA	Pearson Correlation	0.295	1.000
	Sig. (2-tailed)	0.327	
	N	13	13

Table 45 : LOP vs TLA Correlation Best Case.

<i>Correlations Keane Worst Case</i>			
		<i>LOP</i>	<i>TLA</i>
LOP	Pearson Correlation	1.000	0.407
	Sig. (2-tailed)		0.060
	N	26.000	22.000
TLA	Pearson Correlation	0.407	1.000
	Sig. (2-tailed)	0.060	
	N	22	22

Table 46 : LOP vs TLA Correlation Worst Case.

From Tables 45 and 46, no significant relationship between LOP and TLA can be established with  $p > .05$ , but we have to bear in mind here the low n.

Whereas Marquardt analysed LOP at the organizational level, this study is also curious to see whether the positive and significant relationship between LOP and TLA also holds at the individual subsystem level.

		<i>Correlations</i>				
		<i>Learning</i>	<i>Organization</i>	<i>People</i>	<i>Knowledge</i>	<i>Technology</i>
TLA	Pearson Correlation	0.26	0.31	0.32	0.28	0.31
	Sig. (2-tailed)	0.00	0.00	0.00	0.00	0.00
	N	366	366	366	366	366

Table 47: TLA vs LOP Correlation Analysis.

From table 47 a moderate positive and significant relationship between LOP subsystems and TLA scores at IOT sector level. This test is applied below to subject institutes who have returned highest and lowest LOP scores.

		<i>Correlations Burke Highest LOP Score</i>				
		<i>Learning</i>	<i>Organization</i>	<i>People</i>	<i>Knowledge</i>	<i>Technology</i>
TLA	Pearson Correlation	0.010	0.192	0.101	0.118	0.248
	Sig. (2-tailed)	0.969	0.431	0.681	0.631	0.305
	N	19	19	19	19	19

Table 48 : TLA vs Highest Institute LOP Correlation Analysis.

		<i>Correlations Keane Lowest LOP Score</i>				
		<i>Learning</i>	<i>Organization</i>	<i>People</i>	<i>Knowledge</i>	<i>Technology</i>
TLA	Pearson Correlation	0.260	0.242	0.312	0.299	0.498
	Sig. (2-tailed)	0.199	0.234	0.120	0.138	0.010
	N	26	26	26	26	26

Table 49 : TLA vs Lowest Institute LOP Correlation Analysis.

From Tables 48 and 49 no significant relationship between LOP and TLA can be established with  $p > .05$ , save for technology application / TLA relationship in the case of the Keane Institute  $r = .498$  and  $p = 0.010$ . Again, n is low so caution is needed with respect to conclusions at institute level.

A correlation test of LOP subsystems against TLA subsystems was then applied to the entire data set at individual response level to ascertain whether any clusters emerged with correlations of significance. From this analysis one return showed a

significant  $p$  from 70% of the cross-tabulations. Here correlation was weak. The return concerned a statement around the use of a learning management system for assessment. All correlations observed, in this large cross-tabulation, were weak.

		<i>Correlations</i>		
<i>All Institutes</i>		<i>Preparation</i>	<i>Delivery</i>	<i>Assessment</i>
Learning	Pearson Correlation	0.186	0.240	0.211
	Sig. (2-tailed)	0.000	0.000	0.000
Organization	Pearson Correlation	0.227	0.267	0.268
	Sig. (2-tailed)	0.000	0.000	0.000
People	Pearson Correlation	0.275	0.289	0.221
	Sig. (2-tailed)	0.000	0.000	0.000
Knowledge	Pearson Correlation	0.222	0.231	0.235
	Sig. (2-tailed)	0.000	0.000	0.000
Technology	Pearson Correlation	0.253	0.256	0.258
	Sig. (2-tailed)	0.000	0.000	0.000
N		366.000	366.000	366.000

Table 50 : LOP vs TLA Subsystems Correlation Analysis Sector.

Table 50 shows significance in all cross-tabulations with, in general, a positive weak to moderate correlative effect between subsystems.

Next a correlation test of LOP subsystems against TLA subsystems is applied to the individual institute data set at individual response level to ascertain whether any clusters emerged with correlations of significance. A sample from these correlation tests is next presented.

		<i>Correlations</i>		
<i>Heaney</i>		<i>Preparation</i>	<i>Delivery</i>	<i>Assessment</i>
Learning	Pearson Correlation	0.334	0.495	0.462
	Sig. (2-tailed)	0.014	0.000	0.001
Organization	Pearson Correlation	0.319	0.453	0.413
	Sig. (2-tailed)	0.020	0.001	0.002
People	Pearson Correlation	0.432	0.543	0.407
	Sig. (2-tailed)	0.001	0.000	0.003
Knowledge	Pearson Correlation	0.406	0.408	0.436
	Sig. (2-tailed)	0.003	0.002	0.001
Technology	Pearson Correlation	0.206	0.364	0.421
	Sig. (2-tailed)	0.138	0.007	0.002
N		53.000	53.000	53.000

Table 51 : LOP vs TLA Subsystems Correlation Analysis Heaney.

In the case of Heaney all subsystems cross-tabulations, save for the technology application subsystem against the preparation subsystem, show significance. Cross-tabulations here displaying significance returned medium positive correlations.

		<i>Correlations</i>		
<i>Shaw</i>		<i>Preparation</i>	<i>Delivery</i>	<i>Assessment</i>
Learning	Pearson Correlation	0.159	0.180	0.093
	Sig. (2-tailed)	0.143	0.098	0.395
Organization	Pearson Correlation	0.237	0.252	0.112
	Sig. (2-tailed)	0.028	0.019	0.306
People	Pearson Correlation	0.189	0.226	0.125
	Sig. (2-tailed)	0.081	0.037	0.251
Knowledge	Pearson Correlation	0.227	0.241	0.059
	Sig. (2-tailed)	0.036	0.025	0.591
Technology	Pearson Correlation	0.322	0.304	0.191
	Sig. (2-tailed)	0.002	0.004	0.078
N		86.000	86.000	86.000

Table 52 : LOP vs TLA Subsystems Correlation Analysis Shaw.

In the case of Shaw all cross-tabulations in the organization transformation, knowledge management and technology application subsystem showed significance against the preparation and delivery TLA subsystems. Cross-tabulations here displaying significance returned weak positive correlations.

		<i>Correlations</i>		
<i>Synge</i>		<i>Preparation</i>	<i>Delivery</i>	<i>Assessment</i>
Learning	Pearson Correlation	0.097	0.139	0.081
	Sig. (2-tailed)	0.541	0.378	0.610
Organization	Pearson Correlation	0.157	0.106	0.252
	Sig. (2-tailed)	0.321	0.505	0.107
People	Pearson Correlation	0.196	0.079	-0.029
	Sig. (2-tailed)	0.214	0.617	0.857
Knowledge	Pearson Correlation	0.178	0.095	0.089
	Sig. (2-tailed)	0.260	0.549	0.577
Technology	Pearson Correlation	0.216	0.112	0.057
	Sig. (2-tailed)	0.170	0.481	0.719
N		42.000	42.000	42.000

Table 53 : LOP vs TLA Subsystems Correlation Analysis Synge.

In the case of Synge no significance is revealed in the LOP subsystems and TLA subsystems cross-tabulations. In the case of Wilde all the cross-tabulations between the people empowerment and the knowledge management subsystems and all three TLA subsystems, show significance. In addition, cross-tabulations between the learning dynamic subsystem and the delivery and assessment TLA subsystems reveal significance. Cross-tabulations here showing significance returned moderate positive correlations.

		<i>Correlations</i>		
<i>Wilde</i>		<i>Preparation</i>	<i>Delivery</i>	<i>Assessment</i>
Learning	Pearson Correlation	0.241	0.471	0.402
	Sig. (2-tailed)	0.176	0.006	0.020
Organization	Pearson Correlation	0.284	0.259	0.315
	Sig. (2-tailed)	0.109	0.146	0.074
People	Pearson Correlation	0.348	0.410	0.358
	Sig. (2-tailed)	0.047	0.018	0.041
Knowledge	Pearson Correlation	0.469	0.410	0.370
	Sig. (2-tailed)	0.006	0.018	0.034
Technology	Pearson Correlation	0.181	0.249	0.264
	Sig. (2-tailed)	0.314	0.162	0.138
N		33.000	33.000	33.000

Table 54 : LOP vs TLA Subsystems Correlation Analysis Wilde.

## 5.6 Summary

Having secured the data set, the findings then presented argument around the validity of the LOP and TLA instruments used. Logically the next step in the findings chapter, following these validity and reliability tests was to establish the representative nature of the data set in comparison with the population as whole. There was reasonable success here under most parameters, while in others no definitive result could be observed, due partly to the unavailability of comparative data. The chapter then proceeded to develop descriptive statistics from the data set. These included areas such as age, sex, discipline / management level etc. Next the LOP and TLA scores were tabulated. Having described and compared LOP scores separately from the management and academic cohorts against empirical data, it was then argued, in line with Marquardt's (2002) approach that these scores should be combined to give a more balanced LOP score for the subject institutes.

Having validated the survey tools and established LOP and TLA scores the chapter next moved to the cross-tabulation analysis phase between LOP returns and TLA returns and there subsystem interactions. These cross-tabulations were first applied at sector level and subsequently at subject institute level. At this juncture the study findings will be applied to the original research question and sub-questions. From this it is hoped to tease out any further analysis which this phase may prompt. Logically the study now revisits the original research question and its derivative sub questions to see if the findings contributed in any way to answering these questions.

The research question proposed was

*Is it possible to correlate, the identification of learning organization maturity, with the level of integration of ICT into TL&A in the IOT sector in Ireland?*

During the findings analysis to this point the study shows that at sector level tests returned a moderate positive correlation, while at institute level six of the ten subject institutes displayed significance around correlation.

Sub Questions that were identified are.

*1. Is it possible to establish learning organization maturity for individual institutes or the IOT sector as a whole?*

In findings to this point, this study has established learning organization maturity scores for all ten subject institutes and a mean learning organization maturity score for the IOT sector as a whole.

*2. Is there anyway to compare findings in learning organization maturity with other studies in this area?*

The study used two empirical comparisons here. First it compared scores calculated with Marquardt's 500 which was an average LOP score for 500 cases studies, mainly in business. Calculated scores were also compared with those established from a study carried out in Ohio State University.

*3. In establishing the learning organization maturity of the subject institutes, are there differences or similarities in learning organization maturity views between the various stakeholder groups studied?*

In this chapter differences in scores were established between various stakeholders in the management and academic cohorts, and between managers and academics.

*4. Is it possible to establish the level of integration of ICT into TL&A?*

As the TLA tool established for this study was tested for validity and reliability under a number of criteria and found to be reasonably sound, the study has established with reasonable certainty the level of integration of ICT into TL&A in the subject institutes.

*5. Is there anyway to compare findings on the integration of ICT into TL&A with other studies in this area?*

The study developed some comparative analysis in this area.

6. *In establishing the level of integration of ICT into TL&A are there differences or similarities in the integration of ICT into TL&A views between the various subsets within the data ?*

Table 29 shows different scores across subject disciplines for the sector as a whole.

7. *Do institutes presenting high levels of learning organization maturity display successful ICT integration into TLA?*

In the analysis presented a weak to moderate positive correlation at sector level was established in addition to similar findings in 6 out of 10 of the subject institutes. However the low sample number returned from some of the subject institutes presents a caveat which prompts further analysis.

Table 55 below gives a summation of the correlation returns revealed in the cross-tabulations in tables 50 to 54 on subject institutes between LOP and TLA subsystems at subject institute level. Table 55 shows where correlation was observed. In general  $r$  values are described as

- $r$  values greater than **.50** indicate a **strong** (S) correlation
- $r$  values around **.30** indicate a **moderate** (M) correlation
- $r$  values less than **.20** indicate a **weak** (W) correlation

Intuitively Table 55 shows that most commonly occurring correlations of LOP subsystems with the integration of ICT into preparation, delivery and assessment across the institutes are by the people empowerment, and technology application subsystems.

The least common influencing subsystem here is learning dynamics. Given the low sample numbers associated with some of the individual institutes, the writer, on reflection, felt it pertinent to apply further statistical analysis at sector level to ascertain if the trends established at subject institute level as summarised in table 55 were replicable at sector level

		LEARNING	ORGANIZATION	PEOPLE	KNOWLEDGE	TECHNOLOGY
Beckett	Preparation		S	M to S		M
	Delivery		M to S	M		
	Assessment		S	S	M to S	M to S
Behan	Preparation			S		M to S
	Delivery			M to S		
	Assessment			M to S		M to S
Heaney	Preparation	M	M	M to S	M to S	
	Delivery	M to S	M to S	S	M to S	M
	Assessment	M to S	M to S	M to S	M to S	M to S
Keane	Preparation					M to S
	Delivery					M
	Assessment					M to S
Shaw	Preparation		M		M	M to S
	Delivery		M	M	M	M to S
	Assessment					
Wilde	Preparation			M to S	M to S	
	Delivery	M to S		M to S	M to S	
	Assessment	M to S		M to S	M to S	

Table 55 : Subsystems Cross Tabulation.

Correlations		
		TLA
Learning	Pearson Correlation	0.26
	Sig. (2-tailed)	0.00
Organization	Pearson Correlation	0.31
	Sig. (2-tailed)	0.00
People	Pearson Correlation	0.32
	Sig. (2-tailed)	0.00
Knowledge	Pearson Correlation	0.28
	Sig. (2-tailed)	0.00
Technology	Pearson Correlation	0.31
	Sig. (2-tailed)	0.00
N		366.00

Table 56 : TLA vs LOP Subsystems at Sector Level.

ANOVA(c)						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	3255.10	1.00	3255.10	40.45	0.00a
	Residual	29288.80	364.00	80.46		
	Total	32543.90	365.00			
2	Regression	3948.57	2.00	1974.28	25.06	0.00b
	Residual	28595.33	363.00	78.78		
	Total	32543.90	365.00			
A	Predictors: (Constant), People					
B	Predictors: (Constant), People, Technology					
C	Dependent Variable: TLA					

Table 57 : LOP Subsystems vs TLA Annova.



		Coefficients(a)				
		Model				
		1		2		
		(Constant)	People	(Constant)	People	Technology
Unstandardized Coefficients	B	53.17	0.61	49.35	0.38	0.36
	Std. Error	2.38	0.10	2.68	0.12	0.12
Standardized Coefficients	Beta		0.32		0.20	0.19
T		22.38	6.36	18.41	3.08	2.97
Sig.		0.00	0.00	0.00	0.00	0.00
95% Confidence Interval for B	Lower Bound	48.50	0.42	44.08	0.14	0.12
	Upper Bound	57.84	0.79	54.62	0.62	0.60
A	Dependent Variable: TLA					

Table 58: LOP Subsystems vs TLA Regression.

The two tests chosen for this analysis were correlation of LOP subsystems with TLA scores and multivariate analysis with TLA scores as dependent variable and all LOP subsystem variables as independent variables. The results of this analysis are presented in tables 56, 57 and 58. In Table 56 the most significant correlations returned from cross tabulation here are in the people empowerment subsystem, first and technology application subsystem, second. This is in keeping with findings at the subject institute level analysis which were summarized in Table 55. The ANOVA in Table 57 tells us that the independent variables of people and technology can reliably predict the TLA (the dependent variable). This again underpins findings in Table 55. Table 58 indicates that for every unit increase in the independent variable, the dependent variable TLA is increased / decreased. For example with the people variable on its own in this model every unit increase in the independent variable people empowerment there is a predicted .61 increase in dependent variable TLA. This concludes the findings chapter.

## Chapter VI Conclusions

### 6.1 Introduction to Conclusions

*"I cannot stand being taught - but I enjoy learning". Sir Winston Churchill.*

During the last decade of the 20th century, and into the beginning of the 21<sup>st</sup> century the emergent ubiquity of computing (Hawkins et al, 2002, Smith 2003, SURF 2004, Weckmann & Engert 2005) and the idea of strategic thinking (Ansoff 1979, Mintzberg 1994, Bryson 1995, Lerner 1999 Bates 2000, Curran 2004, White & Weathersby 2005) have become increasingly important drivers in the operations of higher education institutes. This study looks at these two themes in the context of IOT sector in Republic of Ireland. The IOT sector in the Republic of Ireland comprises 13 small to medium size colleges which make up about 50 % of the higher education learning places in the state. The other 50% is made up of the university sector, which comprises 7 universities. The study sought to investigate whether any parallels exist between the emergence of strategic thinking against a framework of learning organization maturity and the level of integration of information and communications technology (ICT) into teaching learning and assessing (TLA) in the IOT sector.

This study is set in an era when higher education institutes, similar to private business organizations are required to adapt and change at an increasingly frenetic rate to new market conditions, student expectations and ever more intrusive environmental stimuli. These adaptations are being driven by factors such as globalization, increasing competition, tighter resources, increasing demands from external stakeholders, evolving student lifestyles, pervasive technology and communications and the emergence of the post-industrial society where it is envisaged the required graduate will be a knowledge worker employed in a knowledge economy. This is particularly true of Ireland, a small open economy on the periphery of Europe which is currently haemorrhaging its traditional manufacturing base to less costly eastern European and Asian states. The current mantra of the Irish Government and all its agencies is to transform Ireland into a leading knowledge economy as soon as possible.

Therefore, the question arises as to what type of higher education institute is required to produce new knowledge workers and even transform traditional workers into knowledge workers? The answer suggests a higher education institute which

operates similarly to what is expected of any new knowledge economy entity. Senge (1990), Cross and Israelit (2000), Marquardt (2000) and others advise that knowledge economy entities are ones that embrace the learning organization model.

While the learning organization model is supported by many in the literature the writer acknowledges that it has its detractors also for example Brown and Keep (2003) who are concerned that the ideas around learning organization theory arise mainly from authors with a business perspective and are thus pre-determined and narrowly focused. One reason for this perhaps is that there is a lack of empirical evidence of successful deployments of the learning organization concept in many studies. For example Coopey (1995), Blackler and McDonald (2000) and Ferdinand (2004) in their work have noted the lack of empirical studies relating to the connection between power and politics and organizational learning. This lack of empirical work must also contribute to the view that learning organization theory, like many other yet to be proven management theories, is embraced with a certain amount of scepticism in higher education institutes. Contu et al (2003) suggest the learning organization model ought not to be interpreted as a management fashion. They also contend that the learning discourse is 'deeply problematic', which again reflects the complexity involved. Sennett (1998) adds to this scepticism from the perspective of the learning organization approach being adopted in a higher education setting, in that this approach ought to be rejected because of its roots in what Nyham et al (2004) describe as '*hard nosed human resource management theory*'. This is in keeping with Sennett's overall questioning of modern flexible capitalism and attempts to introduce such ideas (Deem 2001) into higher education.

The writer disagrees with these views however from both a theory and a praxis dimension. From the theory dimension as explored in more detail in earlier chapters the writer found that the learning organization approach is suitable as a model in the higher education setting. Franklin et al (1998) propose "*that universities, as providers of management education, have both privileged opportunities and critical responsibilities to seek to adopt the ideal and practices associated with the concept of the learning organization*". Whereas White & Weathersby (2005) contend faculty can use their knowledge of learning organization research and theory to help create learning organizations in higher education. Contu et al (2003) in their critique of learning organization theory contend that even though the discourse is 'deeply problematic' it may be possible for ideas around the learning organization to assist in resolving organizational conflicts. From the praxis side, the actual parallels seen in

the recent partnership projects in the IOT sector in Ireland and those of a learning organization approach were delineated in earlier chapters. Moreover, the idea that a higher education institute must respond in ever shorter timeframes in adopting new pedagogical cultures and programs being driven by constant environmental change, ought to obviate the need at least to investigate frameworks such as those espoused in learning organization theory. It was worthwhile in this study to look at a model like the learning organization profile (LOP) in that a limited amount of empirical research exists (Yeo 2002) in a higher education setting using this approach at this juncture. Thus the need for additional investigation around this theme is timely. Some empirical work which applies the learning organization framework to higher education does exist, e.g. in Kezar (2005), Harman (2005) and Berrio (2006).

So logically, this study fits into this drive towards the knowledge economy currently the strategic focus of "Ireland Inc.", in that it examines in a small way important building blocks of the knowledge economy through the efficacy of ICT integration in higher education institutes against the strategic framework of a learning organization model. While a lot has been written about learning organizations and organizational learning in the literature from for example Argyris and Schön (1978,1996), Senge (1990), Watkins and Marsick (1997), Pedler, Burgoyne and Boydell (1997), Marquardt (2002), Small and Irvine (2006) and many others, there appears to be a dearth of work which links the theory to the application or practice. Here, the writer suggests that this study in a small way contributes in this area in that it attempts to link the theory of the learning organization to an empirical exercise in trying to establish the level of learning organization maturity in the IOT sector in Ireland.

## **6.2 Research Question & Literature Review**

The study set out initially to identify strategic frameworks around the integration of ICT into TL&A in higher education institutes. Higher education institutes in the IOT sector were themselves, only in the initial stages of engaging with strategic planning at any level in their organizations, and indeed had not yet explored mechanisms for measuring the efficacy of these engagements. The writer was also aware of the lack of suitable strategic frameworks being employed in the integration of ICT into TL&A in the IOT sector as again strategic planning at this level was also in its infancy. However, despite these deficits, the writer was still determined to somehow examine the IOTs level of organizational strategic awareness. Should it prove possible to establish that awareness, then, the study wished to explore if this awareness or

maturity, had any influence on or correlation with ICT integration levels into TL&A in the subject institutes.

During the examination of the literature into the evolution of strategic thinking, the writer came upon the phenomenon of the learning organization, which seemed to have evolved naturally from Ansoff (1979), Mintzberg (1994), Porter (1980) and others strategic management writings through to Argyris and Schön (1978,1996), Senge (1990), Watkins and Marsick (1997), Pedler, Burgoyne and Boydell (1997), Marquardt (2002) and Small and Irvine (2006) theory and practice on the learning organization. Learning organization maturity for an entity may be viewed, analogously, as continuous professional development or life long learning for an individual. The learning organization phenomenon seemed to fit well with what the writer sought as a framework for strategic thinking giving an opportunity for a novel and modern approach to the study. The next hurdle to be crossed was to ascertain whether it was possible to establish a measure of this learning organization maturity in relation to the higher education institutes under examination. This led the writer to examine frameworks from for example Watkins and Marsick (1997), Pedler, Burgoyne and Boydell (1997) Marquardt (2002) and Small and Irvine (2006). Marquardt's (2002) LOP tool was thought to show best fit with the theme of this study. Professor Michael J. Marquardt (2000) who along with others such as David Schwandt (2000) had explored and applied in practice learning organization maturity theories in many case studies. The tool they used, called the learning organization profile (LOP), consisted of five subsystems namely learning dynamics, organizational transformation, people empowerment, knowledge management and technology application. These subsystems and the LOP tool as a whole seemed to have the elements required for the idea of a measure of learning organization maturity, which the writer sought to address the strategic focus aspect of the study. The tool in praxis had been applied to mostly business type organizations. The writer, by employing this tool, was continuing the practice, mentioned many times in the literature (for example Meek 2003), of applying strategic methodologies first used in business organizations subsequently to a higher education setting.

In the literature the leadership role was examined in light of its importance in sustaining innovation in higher education institutes. Researchers here for example Fullan (1993) and Collis and Van der Wende (2002), commented that it was important that leaders be appointed at various levels within higher education institutes in order to support sustained effort in ICT appropriations. Here examples

from both theory and case studies underpinned this theme. In relation to ICT integration in the IOT sector in Ireland it was observed that no posts at senior management level had yet been established, similar to that say of a Chief Information Officer (CIO) in a business organization. This can make it difficult for IOTs to ensure seamless alignment of ICT and overall strategies, something Sauer & Yetton (1997) suggest is desirable in a modern organization.

Having found and adapted the LOP tool to address the strategic focus aspect of the study, the writer's next requirement from the literature was to establish if tools or models existed which might readily measure the level of integration of ICT into TL&A in the subject higher education institutes. While acknowledging that the ideal way to make a measure of ICT integration is to monitor behaviours of use over time in a longitudinal study, this is not always feasible. The writer, having anchored the strategic focus aspect of the study in the well tried LOP tool, decided to develop a new tool to measure the level of integration of ICT into TL&A, having decided that models proposed by for example Davis et al. (1989) and Rogers (1995) were suited to the cross-sectional nature of this work. In order to mitigate in some way risks associated with a new tool, the tool was developed in a similar fashion to the already well accepted LOP tool, in that it used a likert type questionnaire, a well established methodology in social research. This tool was referred to as the teaching learning and assessing (TLA) tool. The tool was devised to provide a snapshot of ICT integration into TL&A in the subject institutes. The TLA tool, having been modelled on the LOP tool, could also follow the argument around aggregation of data associated with that tool. This aggregation of data refers to the accumulation of individual scores to a mean score for an entire entity. The TLA tool was tested statistically for validity and reliability, similarly to the LOP tool, and the results here fell within the required norms for social research.

During the literature review stage of the study the writer defined and refined the main research question. The final version of the main research question posed by this study was:

*Is it possible to correlate the identification of learning organization maturity with the level of integration of ICT into TL&A in the IOT sector in Ireland?*

### 6.3 The Framework for Analysis

In order to establish grounding for the research question, the study examined the literature to understand the evolution of strategic thinking and ICT integration strategies in chapter II. A continuum from basic strategic analysis tools through to complex topics such as systems thinking and organizational learning was identified. OECD (2005) suggest that *ICTs are key enablers in economic growth*. Buy-in was identified as essential to success in ICT integration strategies in many empirical works for example the writings of Hagner and Schneebeck (2000). Evidence was established revealing dissonance between strategic intent and what actually happens on the ground in praxis from the samples of empirical data that were referenced in studies such as Collis and Van der Wende (2002), the Seuss Project (2003) and Kop, et al (2004) in Europe, Hawkins et al (2005) in the US and Kearns (2002). This evidence is in keeping with theories such as 'drift' (Ciborra et al 2001) and strategic alignment (Ciborra et al 2001 and Verweire and Berghe 2004) in ICT diffusions. The ubiquity of computing (Hawkins et al, 2002, Smith 2003, SURF 2004, Weckmann & Engert 2005) within higher education has happened in a relatively short time frame. Researchers such as Cornford and Pollock (2003) comment on codification and standardisation here. The writer's opinion here is the IOTs in Ireland are in catch up mode presently in relation to these standardisations.

Higher education institutes ought to be outward focused in order to maintain the correct strategic direction. This is particular pertinent in the IOT sector in Ireland, where almost all funding is dependent on external stakeholders both national (DOES/HEA) and international (EU).

The emergence of learning organization maturity as a strategic theme was explored in more detail in the next phase of the study in Chapter III. In a sequential process following from chapter II the evolution of strategic thinking into systems thinking, as a way to understanding the complexities of strategic formulation in modern organizations, and how this applies to higher education institutes was looked at. The discussion evolved through Mintzberg's (1994) schools through Baldrige's (2006) systems perspective in education to Argyris and Schön's (1978, 1996) learning loops.

This idea of learning loops is explored further and compared with individual attitude to innovation and change. The various levels of learning and understanding for the organization were explored through, in the main, Argyris and Schön's (1978, 1996)

writings on the subject. There followed an exploration of what is the norm associated with a learning organization, based on the theory, and what needs to happen in order for an entity to become a learning organization. In the literature review here obstacles to achieving learning organization maturity were observed. One element associated with people empowerment, required to achieve learning organization maturity is to allow individuals to become involved in strategic development lifecycle on a continuous basis. It became clear that individuals, through engagement with the strategic process, must become aware of what their role means to themselves, their peers, their departments and their institutes.

Chapter III also explored how best faculty might be engaged (Hagner and Schneebeck 2000) in the integration of ICT into TLA against the framework of a learning organization maturity. Here professional development programs are examined by for example Hagner and Schneebeck (2000), Marquardt (2002), Cartelli (2007) and others as a means to achieve this integration. Unfortunately little evidence emerged in literature review phase of the study of Argyris and Schön (1978, 1996) 'double loop' learning in these efforts, which may be indicative of an inability on the part of higher education institutes to tackle complexity around this theme, but it is likely also due to the lack of empirical research data available in this domain to-date. Obstacles to engagement, such as fear of change, lack of confidence in / with the technology and intellectual property rights were highlighted. Having recognised these obstacles, many bodies, such as the EU, have invested in what we can call generically eCompetence support programs. Again because of the newness of these initiatives the jury is still out on their level of effectiveness.



Figure 20 : Learning Organization Maturity.



An organization which is embracing the learning organization philosophy, is one where people are working co-operatively in networks in their own groups / departments, with aspirations towards working inter-departmentally and inter-organizationally. Naturally to affect increased efficacy in these networking processes higher education institutional members (McPherson & Whitworth 2008) are going to engage means to achieve this end. One of the key means available to all stakeholders in higher education in the early part of the 21<sup>st</sup> century arises from the ubiquity of computing (Hawkins et al, 2002, Smith 2003, SURF 2004, Weckmann & Engert 2005, McPherson & Whitworth 2008), given ICTs capabilities in the sharing and dissemination of information and its innate ability in facilitating easier networking. Secondly, an organization which is embracing the learning organization philosophy, is one which learns from past activities and questions its own processes continuously in order to improve the efficacy of future activities. Once again to effect change in this direction the learning organization will seek tools to assist in these tasks. So, increased engagement with ICT for recording organizational events, knowledge management and analysing and questioning current paradigms would seem logical here.

Finally the idea of the modern IOT where the emphasis is shifting from silo type academic expertise to one where cross discipline interactions are being encouraged in both teaching and research matches well with the philosophy of the learning organization. Surely the most effective tool once more, which is available to the higher education institute, to effect these paradigm transformations is ICT. These ideas are modelled in figure 20 above.

## 6.4 Methodology

The methodology employed in this study followed a number of phases. In the first phase the writer described briefly the origins and history of IOT sector in Ireland, in order to set the context of this study. How the IOT sector fitted within the overall higher education landscape in Ireland was then described. Changes over time from a legislative and funding perspective were also delineated. How these changes contributed to current status of the IOT sector were then established. The study was interested in establishing levels of ICT integration and how this might be viewed against an organizational learning framework backdrop.

In the second phase of the study the writer looked to the literature to find empirical studies around strategies for the integration of ICT into teaching learning and assessing. This analysis pursued two main themes. First the writer examined models such as Rogers (1995) theory of diffusion of innovation and Davis et al. (1989) technology acceptance model (TAM), to ascertain whether these tools or methodologies inherent in these tools might be suitable for use in this study. The writer felt these tools did not entirely satisfy the requirements for this particular study. Next the writer looked at other higher education institutes to learn from the strategies they may have employed in the integration of ICT into TL&A, in an attempt to establish best practice in this area. The examination of these strategies although useful for providing understanding of methods did not immediately prompt a tool that the writer felt suited the requirements of this study.

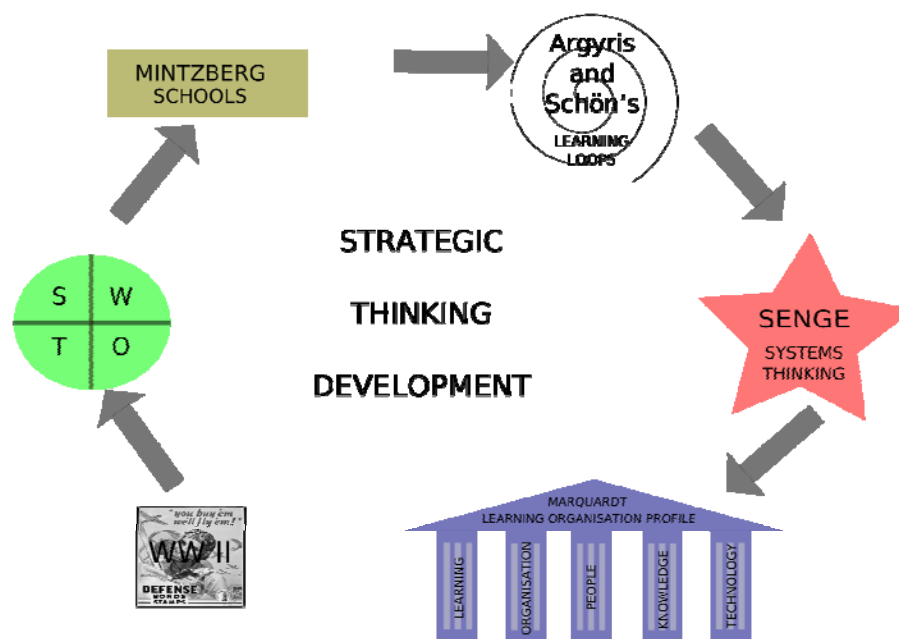


Figure 21 : Strategic Thinking Development.

The analysis of other higher education institutes strategies did however show some commonality in themes towards best practice. In the third phase of the study the writer looked to the literature to examine strategic frameworks that might help establish a measure of strategic maturity suitable for the study. This involved a brief analysis of the history and evolution of strategic thinking as depicted in figure 21 above. This evolution seemed to converge on the phenomenon of organization learning maturity. At this point Marquardt's (2002) learning organizational profile tool (LOP) was chosen, with some minor adjustments to fit more closely a higher education environment, as the strategic framework element required for this study. The writer then returned to the need for a tool to measure the level of integration of ICT into TL&A. It was decided to develop a new tool called the teaching learning and assessing (TLA) tool to complete this task.

In the next phase of the study both tools were tested for validity. Both tools were found to be valid and within the parameters set for social research. Given the wide geographical spread and number of the target population for data gathering the writer decided to place both tools online and invite responses via personalised email which included an embedded uniform resource locator (URL) link to allow easy access to both survey tools. This method of survey delivery fits within the domain of social eResearch (Anderson & Kanuka 2002). The study itself may be said to fit with the drive towards the increasing use of eResearch as eulogised by the European Commission (2006) in their push towards the 'Knowledge Society' and by Australia's (2008) Data Acquisition Accessibility and Annotation eResearch Technology (DART) project as described in Paterson et al (2007). The epistemological base for the methodology was in line with Bryman's (2001) philosophy of pragmatism in social research and fits with the idea of deductive theory as described in Bryman and Bell (2007 p 11).

## **6.5 Results**

In Chapter V the first objective was to establish the validity of the learning organization profile (LOP) and the teaching learning and assessing (TLA) tools. Next the representative nature of the sample was affirmed through various tests and comparisons with empirical data where available. There followed the detailed analysis of the data. From the learning organization maturity framework perspective some interesting results emerged. The overall mean LOP score and LOP subsystem score lay between Marquardt's 500 score the Ohio University scores, which were

used as comparators. In addition it was noted that Marquardt's score has evolved exclusively from business organization case studies. The difference between the study score and the Ohio State University score may be down to the adaptations made to the LOP tool in adjusting some of the statements to suit a higher education setting and the introduction of some negative statements in the tool in order to mitigate the all positive bias (Messick 1962, Friedman 1988) associated with similar social research enquiry tools. Other findings from the LOP scores which would underpin validity was the higher scores in general by managers over academics and the fact that female scored higher than males in both tools which compare with findings in other empirical work. The study now reverts to answering the research question and its derivative sub questions. The original research question was:

*Is it possible to correlate the identification of learning organization maturity with the level of integration of ICT into TL&A in the IOT sector in Ireland?*

The findings chapter explored this question. Six out of the ten institutes examined, displayed significance around correlation tests at individual subject institute level. From Table 44, in Chapter V, a moderate positive and significant relationship between LOP and TLA scores ( $r = .401$ ,  $p = .000$ ) was established at sector level. Intuitively this result is what one would expect.

Sub Questions that were identified were.

*1. Is it possible to establish learning organization maturity for individual institutes or the IOT sector as a whole?*

In the findings in Chapter V the study established scores for all ten institutes using the LOP tool and a mean score for the IOT sector as a whole.

*2. Is there any way to compare the findings in learning organization maturity with other studies in this area?*

In this the study invoked two main comparisons. First it compared scores returned with Marquardt's 500 which was an average LOP score for 500 cases, mainly in business. There may have been a temporal element also in helping to explain Marquardt's lower results, in that these studies occurred mainly in the nineties when the idea of organization learning maturity may only have been emergent. Calculated

scores were also compared with those established from a recent study in Ohio State University. The differences here were explored earlier. These comparisons assist in underpinning the validity of scores in this study.

*3. In establishing the learning organization maturity are there differences or similarities in learning organization maturity views between the various stakeholder groups studied?*

There were many differences established in Chapter V between various cohorts in the study. These included observed differences between institutes, male / female, management / academics, management types and academic subject areas. The male / female discrepancies were shown to mirror results in other empirical studies. The management academic divide reflected similar findings by Marquardt along the management / employee divide returned in his work.

*4. Is it possible to establish the level of integration of ICT into TL&A?*

As the TLA tool established for this study was tested for validity under a number of criteria and found to be reasonably sound, the study can be said to have established a reasonable measure of the level of integration of ICT into TL&A in the subject institutes.

*5. Is there any way to compare findings on the integration of ICT into TL&A with other studies in this area?*

Although this question was poised, it was felt to be beyond the scope of this cross-sectional study. Other studies focusing on ICT integration used rather different tools to measure ICT integration, making comparisons complicated if not meaningless. However, it would have been desirable to do further comparative analysis with other empirical studies in this domain had they been uncovered.

*6. Can the findings of these two strands be accurately correlated?*

Tables 50 to 54 in Chapter V examined this question both at individual subject institute and sector levels. Significance was shown at sector level and in 6 out of the 10 of the subject institutes and at IOT sector level.

7. *Do institutes presenting high levels of learning organization maturity display successful ICT integration into TLA?*

In the analysis presented, a weak to moderate positive correlation at IOT sector level was established, in addition to similar findings in 6 out of 10 of the subject institutes.

Table 55 in Chapter V gave a summation of the correlative analysis at individual subject institute across the LOP and TLA tool subsystems. It reveals where correlation occurred and where significance had been established. Intuitively, Table 55 shows that the most commonly occurring correlations between the LOP subsystems and the TLA subsystems of preparation, delivery and assessment across the institutes was people empowerment, closely followed by technology application. What is interesting to note here is that in organizations whose business is teaching and learning this table reveals the least amount of correlations in this cross-tabulation between the learning dynamic subsystem and the preparation, delivery and assessment subsystems of the TLA tool. Also of interest here is that the Heaney Institute showed correlative affects in all LOP subsystems, while the Keane Institute showed results only in the technology application subsystem.

## 6.6 Further Exploration of the Data

Having answered the research questions set out, the empirical data proved sufficiently rich to allow some further exploration of the data. From a learning organization maturity perspective does this study shed any light on the key ideal of shared vision referred to by Kofman & Senge (1995), Marquardt (2002) and others in the literature on the learning organization?

<b>Institute</b>	<i>Academic LOP</i>	<i>Management LOP</i>	<b><i>Difference</i></b>
Beckett	118.75	122.60	3.85
Behan	120.36	137.57	17.21
Burke	128.69	142.00	13.31
Heaney	123.91	154.88	30.96
Keane	109.50	129.25	19.75
O'Casey	110.50	141.00	30.50
Shaw	118.36	126.57	8.21
Swift	115.25	149.00	33.75
Synge	119.29	128.00	8.71
Wilde	115.90	123.00	7.10

Table 59: LOP Cohort Analysis by Institute.

From Table 59 there is evidence that institutes like Beckett, Shaw and Wilde come closest to engaging with a shared vision while institutes like Heaney, O'Casey and Swift seem furthest from this perspective based on the difference in average LOP scores returned from their management and academic cohorts. It would be interesting to examine further the level of collaboration around strategic thinking and strategy development in the institutes in light of these results perhaps with another tool in order to confirm or reject these hypotheses.

Naturally there are many factors that may affect the level of LOP scores achieved in higher education institutes. For instance, the idea that higher education institutes are not structurally streamlined and thus are unable to change strategic direction quickly is one. The idea that higher education institutes traditionally contained departmental silos re-enforced by academic autonomy with little or no interdepartmental interactions, may be another. Can we say that academics work in project teams or is their role in the main consumed with individualistic interactions with their students? The mantra of interdepartmental, inter-organizational and international collaboration is relatively new to the IOTs in Ireland. Notwithstanding these caveats there is evidence in recent times of efforts to promote learning organization themes within the IOT sector in Ireland. The first example referred to in an earlier chapter was the introduction of partnership approach which encouraged the development of cross-functional teams to get involved in short term projects which had identified goals and rewards. This process also encompassed the concept of continuous professional development (lifelong learning) through personal development plans (PDPs Marquardt 2002). This is indicative of what Marquardt (2002, p. 120) described as balancing the 'individuals and organizations development needs' a key trait of the learning organizations approach through people empowerment.

Nationally in Ireland there is a new focus on how research grants are awarded. For example awarding bodies such as Science Foundation Ireland ([www.sfi.ie](http://www.sfi.ie)) and the Health Research Board ([www.hrb.ie](http://www.hrb.ie)), now look more favourably on applications that display novel inter-organizational and multi-disciplinary team submissions, a move away from the lone or small group applications heretofore the norm. This theme is echoed in reports into higher education research such as for example ICT – The Basis for Innovation (SURF 2008).

The idea of customer feedback, another example of an entity wishing to engage with the learning organization maturity theme on a continuous basis, is now in place in the

IOT sector through the now established QA1 to QA3 quality assurance forms and their associated analysis and results feedback mechanisms. These kinds of developments have their roots in Argyris and Schön's (1978, 1996) writings on single / double loop learning and Senge's (1990) systems thinking approach and Pedler et al (1995) and Marquadt's (2002) work on the learning organization.

Why is people empowerment the most significant LOP subsystem predictor in this study? First off, one can argue that people are both the means and the end product in higher education institutes. Consequently they should feature significantly in organizational learning and implementation strategies. This study seems to be saying that the level of people empowerment in the subject institutes can somehow best predict the level of integration of ICT into the TL&A work practices of academics here. The proposition that one of the main tools at the disposal of an academic, outside of self, to enhance his/her practice is ICT is reasonable. Thus one might propose the counter supposition that the greater the level of use of ICT by an individual academic or the greater the level of eCompetence an academic may possess, the greater the ease with which he/she may be in a position to share knowledge with his/her colleagues and/or students within departments, inter-departmentally and inter-organizationally. This supposition thus may influence the level of their institute's learning organization maturity.

Most research to-date into the effectiveness of ICT alludes to what are referred to as organizational factors. Here we can say that the organizational factor emerging in this study is that of people empowerment through the mechanism of effective ICT diffusion strategies. Overall the level of ICT integration is indicative of how well an organization is in sync with its strategic direction as identified by Masrek et al (2007).

In Table 22 of Chapter V the mean TLA score of 67.98 out of a maximum of 120 which produces a percentage figure of 57% for the IOT sector as a whole could be interpreted as indicating that subject institutes are a little over halfway towards achieving seamless ICT integration with their teaching learning and assessing work practices. Interestingly the LOP average of 118.36 out of a maximum 200 score produces a percentage figure of 59%. So if it were proposed that the measure of learning organization maturity in the IOT sector was to be used as an indicator of strategic alignment then this would indicate that the subject institutes are just a little over halfway towards achieving full learning organization maturity.



This supposition can be viewed through the lens of Argyris and Schön's (1978,1996) ideas on learning. Here one could argue that an individual and his/her theories in use is represented by their individual LOP scores. Then the organizational theory in use (Argyris and Schön 1978,1996) is represented by the institutes LOP score and the IOT sector is represented by the mean LOP score for the sector. The inference from Argyris and Schön's (1978,1996) writings here is that an overall measure such as a LOP score is indicative of how well an organization is performing against its potential optimum.

Writers such as Bennet & Tomblin (2006) on ICT and organizations, have made reference to the symbiotic relationship between people empowerment and the dissemination of ICT. Their work somehow suggests that the more empowered members of an organization are the more they seek tools to engage with other members of the organization in non-hierarchical and non-linear interactions. Conversely these studies suggest the more effective the dissemination of ICT in an organization is the greater the people empowerment. The results seen in this study on these themes seem to support this theory.

Another theme arising from this disquisition, which writers such as Senge (1990) and Willcoxson (2000) highlight in their literature on learning organization maturity is that it may allow increasing autonomy of the individual member of the organization. In higher education institutes the premise of individual academic autonomy is not new. What has changed perhaps, as suggested by this study, is the extent of the boundaries of academic autonomy. Traditional academic autonomy has been bounded by discipline silo paradigms while the requirements of a more flexible entity displaying a reasonable measure of learning organization maturity is one where academic autonomy is networked in many different directions and at many different levels, both intra and extra organizationally. Academic autonomy may be equated with the people empowerment results in this study. ICT can be viewed as an aid to academic networking as reflected in Hanna & Latchem (2002), Leydesdorff & Ward (2005), Browning & Sørnes (2008), McPherson & Whitworth (2008) and others in ICT supported collaborative literature. The eResearch (Anderson & Kanuka 2002, Paterson et al 2007) method of data gathering in this study is also an example in practice of how ICT enhances a researcher's ability to network with colleagues across institutions. Thus the enlargement of an academic's discipline boundaries may be symbiotically connected to ICT integration into his/her work practices in

TL&A. This study underpins this premise, in that it identifies the centrality of people empowerment as a predictor of ICT integration.

In the earlier disseminations of ICT within organizations, the idea of a dichotomy between those who embraced ICT and those who shunned it could be very clearly delineated. The reasons for this dichotomy were multi-factorial and evidenced at different levels within organizations. At organizational level in the early days of ICT appropriations, perhaps because of the silo mentality prevailing related to the fairly rigid hierarchical nature of organisations at that time, the ICT department was often viewed as separate and distant from the core activities of an organization. Even in fairly recent empirical studies in this area e.g. Collis & van der Wende (2002) there are still traces of these dichotomies where divergent views of ICT appropriations are described. Similarly, in many higher education institutes the computer services department may have been viewed as somehow separate or different in the early days.

At an individual level early exposure to the inherent complexity of ICT re-enforced an appetite for non-engagement and thus hindered integration. However with the now pervasive nature of ICT in society, pressure to acquiesce to this unstoppable tide has permeated all parts of the modern higher education institute. The realisation that ICT can indeed help academics support their autonomy and yet increase their ability to network (Hanna & Latchem 2002, Leydesdorff & Ward 2005, Browning & Sørnes 2008, McPherson & Whitworth 2008) and thus evolve new ways of transacting higher education is beginning to be realised.

Many studies such as the Seuss Report (2003) and indeed conferences such as the EDUCAUSE 2003 conference entitled "Balancing Opportunities, Expectations, and Resources", indicate that the type and complexity of ICT projects can influence uptake, which equates roughly with integration in this study. So it is not surprising to report from TLA score findings in the subject institutes that there is only a 4% spread between the highest and lowest scores reported. This small range in scores may be due to the homogeneity of the subject institutes and the homogeneity of the type and complexity of the ICT projects undertaken therein. This homogeneity can be traced back to the history of the IOT sector, which was briefly explored in the first chapter of the study. From organizations with a 35 to 38 year old history it is clear that for the first 30 years of this history the IOT sector was and still is embedded in the same legal framework, funding model, student cohort types, staff profile and *raison d'être*.

In more recent times some differences in strategic focus were also alluded to earlier. However all the major ICT projects undertaken such as student administration systems, financial systems, human resource systems, library and LMS systems are almost identical and being driven by a central umbrella organization called An Cheim base in the Dublin Institute of Technology.

In addition the focus of views on ICT integration from academics perspectives only reinforces this premise. The TLA tool scores may also support the validity of the tool in that the subject institutes are of similar culture and structure and have in the main engaged in the same level of complexity around ICT projects.

## **6.7 Limitations of Study**

Typically in any part-time study of this nature many limitations may arise. There are many sources for these limitations, some related to the resources available for the study including time and personnel, others may arise from the newness of the domain and thus a deficit in the dept and breath of literature available. Limitations will inevitably ensue from the methodology and approach while others will arise from findings and conclusions. Similarly the motivation for the engagement with the subject and the bias of the individual(s) carrying out the study must also be considered.

The timing and personnel issues are related. As part-time research involving one person, who already has a full-time job, the longevity of the study is probably greater than the optimum time for such a work. As a consequence new important ideas from the literature can be overlooked given this resource constraint.

The concept of utilizing learning organization maturity as a strategic framework in a higher education setting to achieve actual metrics is novel. Therefore it is reasonable to place this study in the milieu of exploratory research as described by Yin (1994), Schiller (1997) and Naidu et al. (2002). This is because the literature review revealed few previous studies into the subject which would allow for rigorous grounding and comparison. This supposition may be viewed positively or negatively.

From the perspective of methodology and approach there are limitations arising out of for example how data was gathered. The methodology lies within the milieu of social eResearch as described by writers such as Anderson and Kanuka (2002) and

Paterson et al (2007). The data gathering exercise with its use of open source software and personalised email delivery for participation is an example of a prima facie case study in Anderson and Kanuka (2002) eResearch. However an obvious limitation arises here because the data was gathered anonymously. Thus the writer cannot be sure that those individuals who may have been in a position to offer the most informed responses participated in the study.

The argument / counter arguments in the literature around the use of likert data as scale data (e.g. Friedman (1988) and Clason and Dormody (1994)) is also acknowledged by the writer. However given that Marquardt's (2002) LOP tool has been used and accepted in over 500 cases in the last fifteen years and the fact that the tool passed the statistical validity tests applied in this study allied to much evidence from the literature of likert scale data in this type of social research, the writer is as confident as he can be in its use for analysis in this study. Since the TLA tool was designed along the same principles as the LOP tool and also passed statistical validity tests the writer is also as confident as he can be in its use here.

In the case of findings and conclusions although it was well argued that sample size was adequate the writer is aware that counter arguments using different experts from the literature could be made here. However in mitigation here, it was shown that tests on aggregated data did support the findings returned from individual subject institutes.

From the perspective of individual bias, being that the writer is a middle manager in one of the institutes being studied, it might be argued that the study would be overly influenced from the management perspective. In order to help mitigate this bias in a two separate tools the LOP and the TLA tool were used to gather data in an anonymous fashion using an eResearch survey method which distances the writer from the respondents. Further analysis of the data was developed within cohorts e.g. within the management cohort where both academic and non-academic managers were examined, while academics were looked at within subject disciplines. For completeness and as a possible recommendation for a further larger work the inclusion of all stakeholders in the subject institutes including for example students and support staff is suggested. Also the inclusion of additional tools for ascertaining the learning organizational maturity of the subject institutes, in addition to using multiple data gathering methods (Brewer and Hunter 1989), may have further supported the triangulation process and thus underpinned the ease with which the

study may have been able to generalize its findings. Noble, (2002), Kirkwood & Price (2006) and others advise that there is a lack of empirical evidence into research on the subject of the effective integration of ICT into teaching learning and assessing. This study can be viewed as a small addition to this field.

The study acknowledges that the way in which the LOP tool was used here was to capture a snapshot of where a higher education institute might lie along a hypothetical learning organization maturity continuum. So, this study did not address in any way how the subject institutes may or may not have arrived at a particular point on a hypothetical learning organization maturity continuum. A similar argument may be offered about the TLA tool in how a particular level of measure of ICT integration into teaching learning and assessing may have been arrived at.

## **6.8 Possibilities for Further Study**

One overall theme that has emerged from this study is the idea that there are possible benefits in using learning organization maturity techniques as strategic frameworks. Here the organizational health from a strategic engagement perspective of higher education institutes, or indeed organizations in general, may be gauged. As a further possible exploration of this theme a before and after study might prove beneficial here. In such a longitudinal study, one could first identify a performance indicator which they wished to measure. Next the organization would embark on an intervention for example around a program utilizing learning organization maturity techniques for a certain period. Finally a re-measure of the chosen performance indicator would follow and a comparative analysis with it's initial measure would subsequently be examined. This type of longitudinal study might also establish the extent to which 'double loop or deuterio' learning, Argyris and Schön (1978, 1996), is taking place within the organization

While this study focused on higher education in Ireland, it only canvassed one half of the two-tier system here. Further funded national studies involving all higher education institutes in Ireland in the area of either learning organization maturity and / or ICT integration levels might be worthwhile as a follow on to this study. This type of project may also be worthwhile from the perspective of increasing empirical data in this domain. Similarly, a trans-national comparative analysis could also be of benefit empirically, in an effort to codify international best practice here in paradigms similar to that of the European eCompetence Initiative.

The idea of learning organization maturity and the measure of this parameter, in which this study was involved, and the analysis of results therein might be used as a basis for further study to ascertain how organizational learning takes place in say the Burke institute, which returned the highest LOP score, in comparison with the Keane institute, which returned the lowest. In addition, should better practice be identified here, then, does this somehow imply some competitive advantage that Burke may have over Keane?

## **6.9 Conclusions**

While this exploratory research (Naidu et al. 2002) employed the learning organization model, as adapted from Marquardt (2002), as a strategic framework measure for comparison with ICT integration in higher education institutes, the study acknowledges that the learning organization theme is large and complex and that there are arguments and counter arguments around its suitability as a strategic framework for the higher education setting. The author realises that there are many organizational learning models which could have been adopted for this study such as those of Richards and Goh (1995), Watkins and Marsick(1997) ,Pedler, Burgoyne and Boydell. (1997), Marquardt (2002) and Small and Irvine (2006). However as delineated in Chapters III and IV Marquardt (2002) LOP tool was selected as best fit for this study.

The study concludes that it may be useful to embrace such frameworks in order to somehow measure improvements in strategy development and delivery in higher education in Ireland and elsewhere because of some of the following factors identified during this study:

- the need for expediency required by higher education institutes in adoption new strategies for transformation
- the idea that competition in the higher education setting is emerging in Ireland in the early part of the 21<sup>st</sup> century
- the actuality of scarcer resources and increasing requirement for transparency in accountability
- the need to marry the desires of the individual and the organization while acknowledging the tensions between culture and structure

- the increasing influence of external stakeholders in the business practices of higher education
- the need for collaboration with groups, intra departmentally and intra organizationally in order to secure funding from research bodies
- the need to get best value from the major investment in ICT in higher education
- the need to use best practice in the integration of ICT into teaching learning and assessing as seamlessly as possible
- the emergence of the knowledge economy which seeks the delivery of the knowledge worker from higher education
- the metamorphoses of the student where we now have part time students attending fulltime courses who are increasingly demanding individualistic digitally delivered programmes
- the need to engage the faculty and all internal stakeholders in rapid transformation to ensure the higher education institutes can secure their futures

In the literature the application of learning organization models in both public sector and private organizations is apparent for example in Patterson (1999), Betts & Holden (2003) & Marquardt (2002). Patterson (1999) in a paper called 'The Learning University' supports the idea of the application of the learning organization model to university, based on the works of Senge (1990) and Marquardt & Reynolds (1994), and others. Through her own investigations of transformational change in universities in New Zealand, Australia and elsewhere, she reports that traditional elitism is being superseded by dynamic strategic alliances. These transformations utilize the idea from systems thinking (Senge 1990) inherent in the learning organization model, to realise these collaborations. Indeed this study has alluded to similar patterns emerging in the higher education landscape in Ireland in recent times. Examples of these changes are now blurring the boundaries between the traditional two-tier higher education system in Ireland of universities and IOTs with increasing cooperation within and across these sectors in both teaching and research emerging. Here are some examples described in this study, of how this transformation is manifesting itself:-

- The recent acquisition of autonomy by IOTs in being allowed to make their own awards at degree, masters and PhD levels. This places the IOT sector on a similar footing to the university sector in relation to the making of awards
- The running of the same programs in both universities and IOTs in Ireland such as for example in nursing, is recognising peer ability in the IOT sector in that they can now deliver the same professional qualification as the university sector.
- The move to the same funding system model the Higher Education Authority (HEA). This is an initial step in levelling the playing field as regards access to funding.
- The increasing collaboration in research proposals between universities and IOTs, where many IOTs are making research submissions as equal partners with universities both nationally and internationally.
- The increasing prevalence of memorandums of understanding between institutes in the two segments e.g. one recently signed in 2007 between Athlone IOT and Dublin City University.

To summarise, what can we say this study has revealed about the IOT sector in Ireland in the areas of strategic evolution against a backdrop of a learning organization maturity framework and the correlative aspects of these revelations on the level of ICT integration into teaching learning and assessing. Primarily this study could be viewed as mirroring the strategic evolution of the IOT sector in Ireland in that both have happened at the early stages of this evolution as the impetus for strategy and strategic planning and focus are new here.



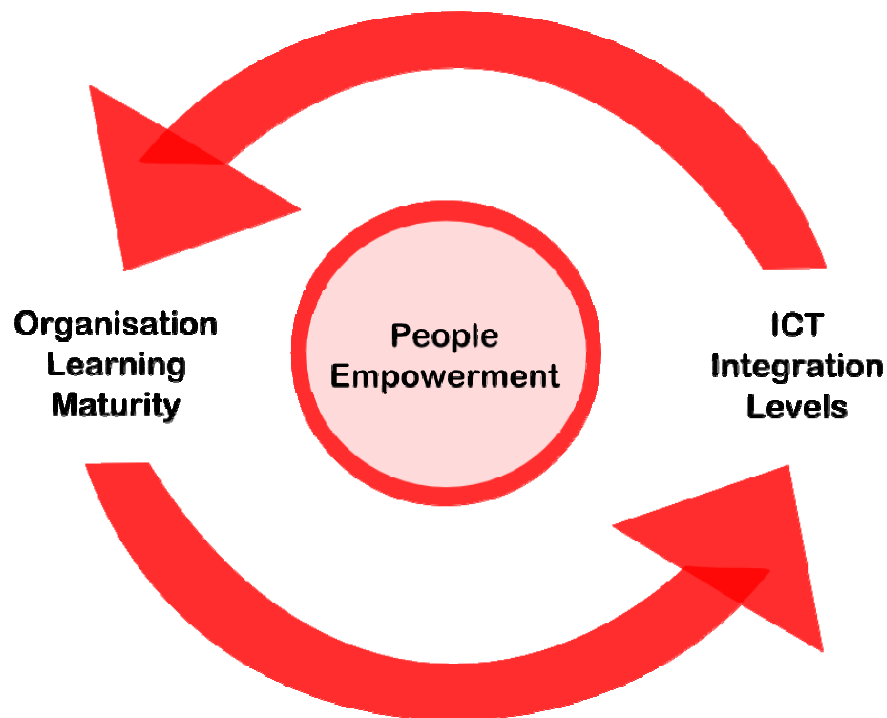


Figure 22. Equilibrium

Notwithstanding this early engagement with the strategic process, evidence has been found of efforts to balance individual and organizational learning in the Performance Management Development System (PMDS) recently rolled out in the IOT sector. The caveat here being the once off rather than cyclical or systems nature of these efforts to-date. From the five pillars of the LOP model used as the framework here it was revealed that people empowerment subsystem showed the most correlative tendencies with levels of ICT integration in the sector and at individual institute level.

A discussion around the reason why the people empowerment subsystem emerged as the lead predictor raised the conundrum of a possible symbiotic relationship between learning organization maturity and ICT integration levels in the IOT sector in Ireland. This discussion is modelled in Figure 22. To adjudicate more clinically on this symbiotic relationship a follow up longitudinal study might well prove worthwhile. In the context of a transformative environment in which the IOT sector in higher education in Ireland finds itself the engagement with strategic frameworks such as the learning organization model may benefit the embedding of the idea of continuous change and adaptation into the mindsets and theories in use of the protagonist stakeholders for the benefit of both themselves and their institutes into the future.

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## Appendix I

### LEARNING ORGANIZATION PROFILE (Management Questionnaire and Part I of Faculty Questionnaire)

(C) Global Learning Associates & Dr. Michael J. Marquardt

Dr Marquardt was contacted in February 2007 and allows use of his tool for this study. Slight adjustments were made to this tool to improve fit for the higher education context. Below is a list of various statements about your organization. Read each statement carefully and decide the extent to which it actually applies to your organization. Use the following scale:

- 4 = applies totally,
- 3 = applies to a great extent,
- 2 = applies to a moderate extent,
- 1 = applies to little or no extent

#### Personal Data

- 1. Discipline \_\_\_\_\_
- 2. Age \_\_\_\_\_
- 3. Gender \_\_\_\_\_

#### I. Learning Dynamics: Individual, Group/Team and Organizational

In this organization ....

- 1. We see continuous learning by all staff as a high priority
- 2. We are encouraged and expected to manage our own learning and development
- 3. People avoid distortion of information and blocking of communication channels through skills such as active listening and effective feedback
- 4. Individuals are not trained and coached in learning how to learn
- 5. We use various accelerated learning methodologies (e.g., mind mapping, mnemonics, peripherals, imagery, music, etc.)
- 6. People do not expand knowledge through adaptive, anticipatory and creative learning approaches
- 7. Groups and individuals use the action learning process (that is, learning from careful reflection on the problem or situation, and applying it to future actions).
- 8. Teams are not encouraged to learn from one another and to share learning in a variety of ways (e.g., via electronic bulletin boards, printed newsletters, inter-group meetings, etc.)
- 9. People are able to think and act with a comprehensive, systems approach
- 10. Teams do not receive training in how to work and learn in groups

#### II. Organization Transformation: Vision, Culture, Strategy and Structure

In this organization ...

- 1. The importance of being a learning organization is not understood throughout the organization
- 2. Top-level management supports the vision of a learning organization
- 3. A climate that supports and recognizes the importance of learning does not exist
- 4. We are committed to continuous learning for improvement
- 5. We do not learn from failures as well as successes
- 6. We reward people and teams for learning and helping others learn
- 7. Learning opportunities are not incorporated into operations and programs

8. We design ways to share knowledge and enhance learning throughout the organization (e.g., systematic job rotation across department, structured on-the-job learning systems)
9. The organization is not streamlined, with few levels of management, to maximize the communication and learning across levels
10. We coordinate on the basis of tasks and goals rather than maintaining separation in terms of fixed departmental boundaries

### III. People Empowerment: Employee, Manager, Customer, Alliances, Partners and Community

In this organization ....

1. We strive to develop an empowered workforce that is able to learn and perform
2. Authority is not decentralized and delegated so as to equal one's responsibility and learning capability
3. Managers and non-managers work together in partnership, to learn and solve problems together
4. Managers do not take on the roles of coaching, mentoring, and facilitating learning
5. Managers generate and enhance learning opportunities as well as encourage experimentation and reflection on what was learned so that new knowledge can be used
6. We do not actively share information with our students, to obtain their ideas and inputs in order to learn and improve our educational programs
7. We give other stakeholders, such as professional bodies opportunities to participate in learning and training activities
8. Learning from partners (such as professional bodies, government, community groups, industry and international partners) is not maximized through upfront planning of resources and strategies devoted to knowledge and skill acquisition
9. We participate in joint learning events with suppliers, community groups, professional associations, and other academic institutes
10. We do not actively seek learning partners among other academic institutes, professional bodies, international partners and industry.

### IV. Knowledge Management: Acquisition, Creation, Storage/Retrieval And Transfer/Utilization

In this organization ....

1. People do not actively seek information that improves the work of the organization
2. We have accessible systems for collecting internal and external information
3. People do not monitor trends outside our organization by looking at what others do (e.g., benchmarking best practices, conferences, and examining published research)
4. People are trained in the skills of creative thinking and experimentation
5. We seldom create demonstration projects where new ways of developing a program and/or delivering a module are tested
6. Systems and structures exist to ensure that important knowledge is coded, stored and made available to those who need and can use it
7. People are unaware of the need to retain important organizational learning's and share such knowledge with others
8. Cross-functional teams are used to transfer important learning across groups, in both academic and non-academic departments.
9. We do not to develop new strategies and mechanisms for sharing learning throughout the organization
10. We support specific areas, units, and projects that generate knowledge by providing people with learning opportunities

## V. Technology Application: Information Systems, Technology-Based Learning, and Electronic Performance Support Systems

In this organization ....

1. Learning is facilitated by effective and efficient computer-based information systems
2. People have no access to the information highway (local area networks, internet, on-line, etc.)
3. Learning facilities (e.g., training and conference rooms) incorporate electronic multimedia support and a learning environment based on the powerful integration of art, colour, music and visuals
4. Computer assisted learning programs and electronic teaching aids (e.g., electronic whiteboards, video conference, pod-casting etc) are not readily available
5. We use groupware technology (e.g. outlook calendar, or a content management system) to manage group processes such as project management, team process, and meeting management
6. We do not support just-in-time learning, a system that integrates high-technology learning systems,( e.g. moodle or some other LMS) coaching, and traditional teaching in a blended single, seamless process
7. Our electronic performance support systems enable us to learn and to perform our work better
8. We do not design and tailor our electronic performance support systems to meet our learning needs
9. People have full access to the data they need to do their jobs effectively
10. We cannot adapt software systems to collect, code, store, create and transfer information in ways best suited to meet our needs

## Appendix II

### Part II of Faculty Questionnaire TLA

Below is a list of various statements about your engagement with information and communications technology (ICT) in your teaching, learning and assessing (TL&A) processes. Read each statement carefully and decide the extent to which it actually applies to you. Use the following scale:

- 4 = applies totally,
- 3 = applies to a great extent,
- 2 = applies to a moderate extent,
- 1 = applies to little or no extent

#### VI. Lecture Preparation

In lecture preparation I

1. Do not use ICT equipment.
2. Use external hardware such as scanners/camcorder/digital camera.
3. Do not use word-processing to prepare classes
4. Use PowerPoint or equivalent to prepare classes
5. Use graphical images as part of the process.
6. Do not download files and integrate data from the internet.
7. Use a learning management system (e.g. Blackboard, Moodle) by yourself.
8. Do not use a learning management system / groupware to work in a team with colleagues in my department.
9. Use a learning management system / groupware to work in a team with colleagues in other department(s) within my organization
10. Use a learning management system / groupware to work in a team comprising of external partners.

#### VII. Teaching & Delivery

In delivery I

1. Do not use ICT equipment.
2. Use a presentation package and an electronic projector.
3. Do not use other ICT equipment such as vc/video/dvd/tv or document camera in the classroom..
4. Use the Internet in the classroom..
5. Deliver lectures completely face-to-face with no on-line delivery
6. Use a learning management system (e.g. Blackboard, Moodle) as an individual..
7. Do not use interactive devices such as quiz keypads.
8. Use a learning management system / groupware to work with a colleague(s) in my own department.
9. Use a learning management system / groupware to work with a colleague(s) in another department.
10. Use a learning management system / groupware to work with a colleague(s) in an external organization.

## VIII. Assessment

In assessing I

1. Do not use ICT equipment.
2. Use a Spreadsheet to Enter / Collate Examination Results.
3. Use an online data entry screen to Enter / Collate Examination Results.
4. Do not use a learning management system / groupware in synchronous (e.g. chatroom) or asynchronous mode (e.g. email, forum) to give student feedback.
5. Use a learning management system (e.g. Blackboard, Moodle etc) to create, manage and mark student assessments online as an individual..
6. I do not use email and or a learning management system to accept student's assignments online.
7. Use anti-plagiarism software in the examination of student assignments.
8. Do not use a learning management system / groupware to work with a colleague(s) in my own department.
9. Use a learning management system / groupware to work with a colleague(s) in another department.
10. I do not use a learning management system / groupware to work with a colleague(s) in an external organization.

## Appendix III

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**From:** Pearse Murphy  
**Sent:** 28 May 2007 12:30  
**To:** XXXXX@ait.ie  
**Subject:** IOTs Online Survey

Dear JENNIFER,

The Centre for higher education ICT Research (CHEIR, Athlone IOT, ), in cooperation with the International Centre for higher education Management, University of Bath, United Kingdom , invites you to complete a short survey on Information and Communications Technology in Teaching Learning & Assessing in the Irish IOTs sector.

All data is anonymous and no connection in findings will be made between individuals and data submitted or organizations and data submitted. You are asked for your email address as an option if you would like some feedback from the survey.

This survey should take no more then 10 – 15 minutes of your valuable time. Thanks in advance for your co-operation.

To complete the survey, please click on the link below,

<http://cheir.ait.ie/index.php?sid=6>

Regards  
Pearse Murphy  
AIT

From: "Pearse Murphy" <pmurphy@AIT.IE>  
To: XXXX@XXXX.ie  
Sent: 16 May 2007 16:36:04 o'clock (GMT) Europe/London  
Subject: Research Request

Dear Registrar,

AIT's Centre for Higher Education ICT Research, in cooperation with the International Centre for Higher Education Management, University of Bath, United Kingdom, is involved in research on Information and Communications Technology in Teaching Learning & Assessing in the Irish IOTs sector. As part of this work it is hoped with your kind permission to gather data via a brief online survey from both Management and Academic Staff at your Institute. If you do not reply to this email, I will assume it is permissible to proceed with the survey.  
The survey should take no more than 10-15 minutes of an individual's time.

Regards

Pearse Murphy B.Sc Comp, MBA

090-6471801

087-2909365

CHEIR

AIT